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ABSTRACT

The bulletin presents projections of the 1985 manpower requirements of 240 occupations for which considerable training is most often required or desirable, and which will comprise an estimated 70 million workers or two-thirds of the civilian labor force at that time. A brief chapter discusses the use of occupational projections and training data for planning and counseling. Another chapter presents projections of occupational requirements for broadly-defined occupational groups through the mid-1980's based on the Bureau of Labor Statistics' studies of economic growth, technological change, and industrial and occupational trends. A third chapter discusses available occupational training offered by: vocational education, apprenticeship programs, employer training, armed forces training, Federal manpower programs, home study courses, junior and community colleges, and colleges and universities. A final 50-page chapter describes in detail for each of 240 occupations in 14 categories: occupational training requirements, statistics on 1972 employment, projected 1985 requirements, projected rate of growth from 1972 to 1985, projected annual openings for growth and replacement, and most recent data on the number of persons completing training. Four appendixes covering 30 pages deal with methods and assumptions for projections of manpower requirements, detailed occupational projections, detailed training statistics, and State employment security agencies. (Author/JR)

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Occupational Manpower and Training Needs

Revised 1974

Bulletin 1824

Information for Vocational Counseling and Planning for Occupational Training

U. S. DEPARTMENT OF LABOR
Peter J. Brennan, Secretary
BUREAU OF LABOR STATISTICS
Julius Shiskin, Commissioner

1974

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Preface

This bulletin presents both general and detailed information on the relationship between occupational manpower requirements and training needs. It is a revision and updating of BLS Bulletin 1701 of the same title. This bulletin was prepared as part of the Bureau of Labor Statistics program for preparing and disseminating projections of the economy to 1985 and information on the manpower implications of these projections. Other Bureau publications presenting information on 1985 projections include the *Occupational Outlook Handbook*, Bulletin 1785; *The U.S. Economy in 1985*, Bulletin 1809; and *The Structure of the U.S. Economy in 1980 and 1985*, Bulletin 1831 (in process).

Information needed to plan education and training programs and for vocational guidance includes projections of occupational requirements and information on occupational training. Chapter 1 of this bulletin discusses how occupational projections and training data can be used for planning and counseling. Chapter 2 presents an overview of occupational projections, and Chapter 3 provides information from a variety of sources on the status of occupational training. Chapter 4 gives detailed information on how workers in specific occupations obtain training, along with projections of requirements for each of these occupations and statistics on training programs to the extent that they are available.

This bulletin was prepared in the Division of Manpower and Occupational Outlook of the Bureau of Labor Statistics under the general direction of Neal H. Rosenthal. Gerard C. Smith supervised the preparation of the bulletin. Harold Blitz, Elizabeth Bullivant, Stephen Ginther, Linda Jarett, Katherine Naughton, H. James Neary, Joan Slowitsky, and Darrel P. Wash contributed to the collection, preparation, and analysis of the data.

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Chapter 1. Using Occupational Projections and Training Data for Planning and Counseling

Planning occupational training programs and counseling young persons to help them make good career decisions are difficult yet extremely important tasks. There is a bewildering array of occupations in the United States economy; more than 13,000 are defined by the *Dictionary of Occupational Titles* published by the U.S. Department of Labor. These thousands of occupations range from simple jobs that can be learned in just a few hours or days to occupations that require several years of specialized preparation.

Occupational projections and training data are key elements in both vocational counseling and planning education and training programs. Although many individuals make wise career choices based on substantial information, others receive little or no guidance and fall into jobs by chance. Some are successful, but others are not because of misinformation or lack of information. In turn, individuals planning training and education programs often do not have sufficient occupational information to plan wisely. As a result, vocational schools may prepare graduates who cannot find jobs in their field of study while shortages exist for workers in other fields.

Projections of manpower needs serve many other purposes as well. In major legislation on training and education, Congress has explicitly indicated that training programs financed by the government should be based on assessments of future manpower needs. In addition, projections may be used to alert government and other interested parties to potential imbalances in manpower supply and demand; to help choose between alternative policies; to assist in administering specific government programs; to provide information necessary for developing other types of projections; and to encourage an informed and responsible public concern for manpower problems.[1]

Information in this bulletin serves all of these purposes. Other Bureau publications, however, focus on some uses more sharply. For example, the *Occupational Outlook Handbook*, which draws on the same body of research, focuses on providing information for use in vocational guidance.

Data in this bulletin reflect the national situation. However, most educational and training planning is done locally. Methods used to convert BLS national manpower projections to local needs are presented in *Tomorrow's Manpower Needs*.[2] Training data and their analysis may be more complete at the local level than at the national level because of the greater availability of such data locally from private schools, community colleges, public training programs, and individual firms.

The Bureau of Labor Statistics (BLS), in cooperation with the Manpower Administration (MA) and the individual State employment security agencies, is conducting two programs designed to develop occupational employment projections for State and local areas for use in manpower and educational planning. The primary program, the National-State Industry-Occupational Matrix System, is designed to provide all States and the District of Columbia with a data base that is consistent in concept and format with national data used by the Bureau of Labor Statistics. Methodological techniques and technical assistance on the use of this data base will be provided to States to develop State and local area projections. The data base consists of an industry-occupational matrix and death and retirement rates. This system will allow for the development of projections for about 400 occupations and 200 industries covering the entire economy.

Since the projections based on the National-State Industry-Occupational Matrix System will not be available in time for fiscal year 1975 manpower planning, BLS, MA, and the State employment security agencies are conducting the Interim Area Manpower Occupational Projections Project. This project will provide employment projections to 1980 for each State and Standard Metropolitan Statistical Area (SMSA) having a population of more than 250,000. Information on the progress in individual States can be obtained from the State agencies listed in appendix D of this bulletin or from the regional offices of the Bureau of Labor Statistics.

Data on projections

To meet the needs of planners and counselors, this bulletin brings together information on future manpower requirements for 240 occupations. These 240 occupations are projected to comprise about 70 million workers in 1985 and account for approximately two-thirds of all workers expected to be in the civilian labor force at that time. These occupations are most often those for which considerable training is often required or desirable. For example, the projections account for almost all professional and technical workers and sales workers, 90 percent of craft workers, and 70 percent of clerical workers.

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[1] These specific uses of manpower projections are discussed in fuller detail in *Manpower Projections: An Appraisal and a Plan of Action* (U.S. Department of Labor, Manpower Administration, August 1967) pp. 22-25.

[2] Bulletin 1606, Vol. 1 (Bureau of Labor Statistics, 1969). This 4-volume publication and its supplements present national manpower information and methods of using this information to develop State and local area manpower projections.

The underlying assumptions as well as methods of developing the 1985 occupational projections are detailed in appendix A of this publication. Some assumptions are quantitative, for example, the unemployment rate, the level of the Armed Forces, fertility rates, population levels, and labor force participation rates. Other assumptions are of a qualitative nature, such as those concerning the international political climate; the institutional framework of the American economy; economic, social, technological, and scientific trends; and fiscal and monetary policies of government. The projections also assume that major problems such as the energy shortage will be solved and therefore will have only a marginal effect on long-term growth.

It also should be noted that the projections contained in this bulletin were completed prior to the oil embargo and resulting petroleum shortage. A major element in these projections was the use of estimates from the Department of Interior which assumed that the increasing shortfall of domestic energy supply relative to demand through 1985 would be met largely by substantial increases in imports of crude oil and petroleum products. In light of the embargo and the need to minimize U.S. dependence on imports, various programs along the lines of "Project Independence" are now under active consideration. Such programs to increase U.S. self-sufficiency in meeting domestic energy requirements obviously would have a substantial impact on consumers, government, and business demand for a whole variety of goods and services. Such changes would, in turn, affect relative growth of industry output, employment, and occupational requirements. The Bureau of Labor Statistics has, therefore, started a major research effort to develop comprehensive sets of alternative projections to those published in this bulletin, which would explore the demand, output, and manpower implications of various strategies for reducing energy demand, expanding domestic energy supply, and minimizing reliance on energy imports. The results of this work will be made available as soon as the study is completed.

Data on projections are summarized in tabular form in appendix B. The table includes data on 1972 estimates of employment, projected 1985 requirements, the percent change from 1972 to 1985, and average annual openings in the period 1972-85 resulting from growth of the occupation and from replacement needs for workers who leave the labor force. Where applicable, each occupation is identified by a vocational education code and/or a code used in the Higher Education General Information Survey (HEGIS code). In the discussion of training needs and openings for each occupation in chapter 4, the same data in appendix B are presented for each occupation.

The accuracy of projections. In using occupational projections for planning and counseling, many questions arise. One frequently asked is how accurately these projections anticipate future trends. Many unforeseen changes may occur as individuals adapt to occupations for which they have not been trained when supply-demand conditions indicate such action, and employers adapt their capital and manpower utilization patterns to avoid problems that stem from shortages of workers in certain occupations.

The ability of workers and employers to adapt to changing patterns of occupational manpower requirements is, however, not sufficient reason to ignore the importance of manpower information for either planning or vocational counseling. The market for workers, despite many successful adjustments to changing requirements, does not work perfectly. During past periods, health officials have complained of shortages of physicians and nurses; consumers have called for more and better trained automobile mechanics and repairmen; and industry has at times needed more scientists and engineers than were available, while at other times more than sufficient numbers were available. In the early 1970's the market for elementary and secondary school teachers shifted from the shortage conditions of the 1960's to a surplus. Perhaps forethought and better planning could have avoided many individual hardships and proven to be more productive for the Nation.

Because of the variety of assumptions and judgments that underlie virtually all occupational projections, it is not possible to have assurance that a particular set of projections will turn out to be an accurate prediction of the future. One cannot predict, for example, the actual effect that the fuel shortages in evidence in early 1974 will have on long-term manpower needs for specific occupations such as gasoline service station attendants, airplane pilots, truckdrivers, and geologists. Nevertheless, the BLS has developed projections for use in guidance and planning within the context of certain assumptions including those concerning energy resources. Users of occupational projections must always be aware of these underlying assumptions.

The accuracy and detail required of projections vary depending on the specific purpose for which they are to be used. For example, projections that are to be used for vocational counseling may require a degree of accuracy far less precise than those to be used for specific planning of training programs.

Evaluations of BLS projections have tended to show that they have been reasonably accurate in the majority of cases. One evaluation of BLS occupational projections presented before the Interstate Conference on Labor Statistics in 1963[3] drew the following conclusions: For 108 occupations for which employment statistics were available (1950 and 1960), 75 of the projections made were considered accurate. In 24 cases the actual employment change was substantially different from the projections but still in the right direction, that is, when above-average growth was projected, actual growth was rapid. In only 9 cases did actual employment move in the opposite direction from the projections. In two other cases the occupation declined or failed to grow when no growth or a decline was predicted.

Another evaluation came to similar conclusions.[4] According to the study, "the projections appear to have turned out reasonably well; not only were trends almost always in the right direction, but the projected growth rates were generally close to the mark." The study pointed out, however, that the record is imperfect and identified some misses. For example, the projections understated GNP and overstated population. These somewhat faulty assumptions affected occupational projections only slightly; for major occupational groups the projections were in the correct direction and, in most cases, varied little in rate of change from current estimates of employment. An assessment of detailed occupations was not included in the analysis.

Current efforts to evaluate BLS projections again indicate that, for the great majority of occupations, the projections are correct in their expectations of the direction of change. Occupations incorrectly projected almost always were either those for which employment data were sketchy or those for which the employment trend changed direction. Because changes in direction are frequently caused by changes in consumer preferences, such as the popularity of longer hair for men, which resulted in a decline in employment of barbers, anticipating such shifts in employment trends is obviously difficult. To reduce the probability for error inherent in making the assumptions on which the projections are based, BLS revises its projections approximately every 2 years. Only the most recent projections should be used for planning and counseling.

Since the projections being evaluated were made, more detailed occupational employment data have become available with the addition of new occupations to the census and the inception of new government and private surveys. These efforts should improve the accuracy of future projections.

An important point to be gained from the evaluations is that the projections tend to be conservatively biased. This means that the expected rate of increase for growing occupations is more often understated than overstated, and job opportunities will more often be better than expected rather than worse.

The above findings point out that projections, even if imperfect, can be very valuable in both planning for training programs and in counseling activities because they indicate areas where the expansion or contraction of training activities are most likely to be useful. Users should keep in mind, however, that the projections in this report are stated categorically—that is, *x* occupation will grow by *y* percent between 1972 and 1985; annual average job openings are expected to equal *z*. These statements are an attempt to present the Bureau's projections in a form most useful to planners and counselors. They represent the Bureau's best judgment, but are dependent on the realization of the assumptions on which the projections are based.

Data on training

Estimates of future manpower requirements constitute only part of the data needed to evaluate the adequacy of education and training programs. Information also is needed on training. By comparing the approximate number of newly trained workers needed annually and the present output of the various training programs, training efforts can be appraised and expanded or contracted. Vocational counselors can also use these data to assess the outlook for occupations.

Knowledge of the different ways people can train for occupations, however, does not provide the information needed for supply-demand analysis or for assessment of the adequacy of vocational education and training programs. Data are needed on the number of individuals completing each type of training, the proportion of those completing training who enter the occupation, and the value employers place on the skills of workers who enter through each route.

For each of the occupations for which projections are presented, an attempt was made to compile statistics on training. During this research, the Bureau has found that gaps in training statistics are the most severe restriction on the analysis of occupational supply. Not only are there significant gaps in data but there are many problems involving data comparability. For example, the level of training for a specific occupation may differ among sources of training: some training may be lengthy and theoretical, whereas other training may be short and emphasize practical skills. Some training prepares students for the most basic of entry levels, while other programs are designed so that a person can enter the labor force at the professional level. Information on the status of occupational training and an assessment of data availability for a variety of training sources are presented in chapter 3. Appendix C summarizes in tabular form all available statistics on occupations for which information on projections is presented in appendix B. Included are data for junior colleges, MDTA programs, the Job Corps, vocational education (both secondary and postsecondary), apprenticeships, college bachelor's, master's, and Ph.D. programs, and first professional degrees.

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[3] Harold Goldstein, *An Evaluation of Experience in Long-Term Projections of Employment by Occupation*, presented before the 21st Interstate Conference on Labor Statistics, San Francisco, June 27, 1963.

[4] Sol Swerdloff, "How Good Were Manpower Projections for the 1960's?" *Monthly Labor Review*, November 1969, pp. 17-22.

Illustrations of ways information may be used

This section illustrates ways that data on occupational projections and training statistics may be used in vocational guidance and planning education and training programs. The illustrations are organized under two headings:

1. Statistical analysis
2. Relating occupational projections to training data.

To use the data properly, one needs a clear understanding of what the specific projections represent. Estimates of demand or requirements in 1985 represent the number of workers who will be required to produce the amount of goods and services implied in the Bureau's model of the economy for that year. Estimates of annual openings represent estimates of jobs that will open because of growth in the occupation and to replace workers who die, retire, or leave the labor force for other reasons. Workers who transfer from one occupation to another are not included in the estimates of job openings in this bulletin because of the lack of information upon which to base such estimates.

Supply estimates, where they are presented, represent the numbers of workers who may enter a particular occupation if past trends of entry to the occupation were to continue. These estimates are developed independently of the demand estimates. Thus, supply and demand in this bulletin are not discussed in the usual economic sense in which wages play a major role in equating supply and demand. Rather, the projections are developed so that planning officials can evaluate what current trends in supply imply for future supply-demand conditions and if needed action can be taken to avert shortage or surplus situations.

Statistical analysis. Ranking occupations by size of occupation, job openings, growth rates, or other measures can be a useful device for some planning purposes. A planner concerned with developing curricula for vocational education programs, for example, may be concerned with finding occupations that are expected to have many job opportunities. A ranking of occupations by estimated annual job openings is a useful statistical tool for this purpose. Extending the rankings to cover additional factors such as size of employment and projected growth rates in specific occupations provides information that can be compared to total employment or expected average growth rates for all workers. An advantage of working with ranked data is that they can be presented in graphic form that can be readily understood by those who are not statistically inclined.

An analyst or counselor also may want to rearrange the data in Appendix table B to a form better suited to his specific purposes. If, for example, an analyst is specifically interested in apprenticable occupations, he or she may note that these occupations fall in the construction crafts, mechanics and repairmen, and industrial production groups. Similarly, jobs can be grouped to indicate those for which college or university, junior college, or other types of training are required or helpful. Appendix table B provides vocational education and higher education codes along with occupational titles to aid individuals in selecting occupations with the desired specifications.

Relating occupational projections to training data. The data on projected annual job openings for specific occupations can be used in conjunction with available training data to provide information for planning and counseling. Analysis of the data, however, should be tailored for the specific occupation under consideration. Conclusions drawn from the data depend on factors such as training paths, sources of occupational entry, and the necessity for specific kinds of training. For example, the analysis and conclusions derived for an occupation for which 4 years of specialized college training are generally required and preferred, but in which entrants came from a variety of other sources, will be much different than that for an occupation in which formal vocational training is recommended but not required. For occupations that do not require formal training, still other conclusions will be appropriate.

National occupational projections and training data have been used in a variety of ways for planning and counseling purposes. The following illustrates how data have been used (1) to compare national occupational requirements with national data on degrees conferred by State colleges and universities, (2) to develop manpower inputs to a State university planning and budgeting system, and (3) to develop county-level projections for guidance and planning. Many other uses of national manpower data have been developed for subnational levels. Many of these utilize State and local area data developed by State employment security agencies. The list in appendix D presents addresses of State research and statistical agencies that may have developed occupational projections, supply and demand studies, and methods of analysis.

Occupational data from the 1971 edition of *Occupational Manpower and Training Needs*, BLS Bulletin 1701, were related to data on degrees conferred in different instructional categories by State colleges and universities in 1968-69.[5] The analysis concluded that the fields of greatest emphasis in State colleges and universities are generally in occupational areas of lowest growth potential in the decade of the 1970's. The data indicated, for example, that three broad fields—humanities, education, and fine arts—accounted for nearly half of the degrees conferred by State colleges and universities while growth in occupational areas associated with these fields was projected to be below the median for all occupations used in the analysis. Conversely, in the areas of city planning, engineering, and health a small proportion of bachelor's degrees (4.3 percent) were conferred by State colleges and universities while occupational projections indicated growth rates above the median. The analysis also pointed to fields such as social science, architecture, and business and commerce where high supply and demand indicate prospective balances, and other fields such as forestry, home economics, library science, and trades and industry curriculums where low supply and low demand also indicate balanced situations.

A study by the University of Georgia[6], presents an integration of occupational requirements data for the State and the Nation. The report relates the projected output of graduates by field to projected manpower requirements in related fields for both the State and the Nation. The information was used for planning specific instructional programs at the University of Georgia.

The study used 64 occupations for which a college degree is required or helpful. The selections were based on information published by the Bureau of Labor Statistics in the *Occupational Outlook Quarterly* article, "Toward Matching Personal and Job Characteristics."[7] These 64 occupational titles and data were compared with similar occupational data for the State of Georgia and provided a basis for national and State comparisons. The data are classified to show relationships in national and State occupational projections and university graduate projections. Table 1, reproduced from the Georgia study, shows, for example, that opportunities for accountants and statisticians are good or very good in both the United States as a whole and in Georgia. On the other hand, the outlook for teachers is considered difficult in the Nation as a whole, but fair in Georgia. Other tabulations in the study show such relationships as Georgia occupational openings as a percent of national openings, the outlook for occupations in Georgia and the Nation, and estimated jobs per graduate in Georgia and the Nation. Tabulations of the data are considered by the authors to be useful for university program planning and budgeting, for counseling students, and for planning at the department and school level.

In Ventura County, California, a great deal of work has been done on a Manpower Projection Model System[8] to develop projections of manpower needs by occupation for the county. The system developed methodology and practical linkages to national and State manpower projections prepared by BLS and the State employment service. By using local (Ventura County Standard Metropolitan Statistical Area) employment data and occupational ratios and methods from the National Industry-Occupational Matrix developed by BLS, local projections were developed.

The results of the Ventura County project produced a first approximation of what the SMSA can anticipate if it follows national trends in industries and occupations. The authors of this system consider these projections to be precise enough to indicate a net increase or decrease in occupational requirements. They do not consider them to be precise as to the specific numbers shown.

The major uses of the projections developed for

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[5] Frank Farner, *Analysis of Employment Trends in Relation to the Degree Production of State Colleges and Universities* (Washington, D.C.: American Association of State Colleges and Universities, October 1971.)

[6] *Manpower Requirements Report to 1980: Jobs for University of Georgia Graduates in Georgia and the Nation* (Athens, Ga., University of Georgia, Office of Program Planning and Analysis, January 1973).

[7] *Occupational Outlook Quarterly*, Volume 15, Number 4, 1972, pp. 11-21.

[8] This description is based on an article by John Van Zant and William H. Lawson, "Early Warning Signals for Program Planning," *American Vocational Journal*, September 1972. A more complete description of the Ventura County system is contained in the article.

Table 1. Average job outlook information for the United States and Georgia, 1973-80

	GEORGIA			
UNITED STATES	NO DIRECT DATA	DIFFICULT	FAIR	GOOD AND VERY GOOD
VERY GOOD	Systems analysts Public relations workers Rehabilitation counselors Dietitians	Personnel and employment workers	Bank officers	Librarians Social workers Insurance and real estate agents[1]
GOOD	Managers and purchasing agents	Veterinarians Pharmacists		Accountants Statisticians
FAIR	Park and recreation workers	Home economists Foresters	Psychologists	Agricultural engineers Lawyers
DIFFICULT	Manufacturers' salesmen Landscape architects Marketing and research workers	Chemists[2] Reporters and writers Physicists[2] Mathematicians Economists Geologists[2] Life scientists Liberal arts majors	Secondary school teachers School counselors Kindergarten and elementary school teachers	Workers in music and art College teachers[3] Speech pathologists and audiologists

[1] Noncollege graduates are also eligible, making the ratings inflated.

[2] Ratings in some occupations in the natural sciences may be low because bachelor's graduates are included.

[3] Does not include master's level college teachers.

SOURCE: *Manpower Requirements Report to 1980: Jobs for University of Georgia Graduates in Georgia and the Nation* (Athens, Ga., University of Georgia, Office of Program Planning and Analysis, 1973).

Ventura County are to provide an early warning system of projected trends in industries and occupations and to provide specific industry and occupational inputs for planning training programs and for vocational counseling.

Chapter 2. Occupational Projections

This chapter presents projections of occupational requirements through the mid-1980's based on the Bureau's extensive studies on economic growth, technological change, and industrial and occupational trends. For information on the assumptions underlying these projections, see appendix A. For more detailed information on projections of occupational requirements, see chapter 4 and appendix B. More detail on the economic and industry projections underlying the occupational projections is presented in *The U.S. Economy in 1985*, Bulletin 1809 (Bureau of Labor Statistics, 1974), and in the forthcoming Bureau publication, *The Structure of the U.S. Economy in 1980 and 1985*, Bulletin 1831.

Factors affecting occupational employment

Many factors will cause changes in employment levels of major occupational groups and specific occupations over the 1972-85 period, but one of the greatest influences will be the variation in growth rates among industries. Rapid growth in an industry would logically create a favorable situation for rapid growth of those occupations that are heavily concentrated in that industry. Similarly, slow growth of an industry would be likely to cause slow employment growth for the occupations which are concentrated in it.

Another factor that also strongly affects occupational employment is the changing occupational structure within an industry. Such changes can result from a variety of causes. Technological innovations that cause changes in machines or procedures used in production processes have a major effect. As a result of technological changes, individual occupations may expand or contract and often new occupations emerge. For example, the computer resulted in the emergence and rapid growth of the occupations of programmers, systems analysts, and computer operators, but contributed to the decline in relative importance of payroll and inventory clerks and a variety of other clerical occupations. Changes in business operations, such as a shift to self-service in stores, also alter the occupational structure of industries. Supply-demand conditions in one occupation can affect the demand for another. For example, jobs have been restructured in hospitals and nurse aides substituted for registered nurses during periods when registered nurses have been in short supply.

Changing occupational structure

Interaction of the various factors affecting occupational growth will greatly change the occupational mix of the U.S. economy between 1972 and 1985. Nevertheless, most long-term trends among the major categories of workers—white-collar, blue-collar, service, and farm workers—are projected to continue.

On the basis of the underlying assumptions discussed in appendix A, total employment is expected to increase by about 24 percent between 1972 and 1985, from 81.7 million to 101.5 million.[9] An increase of about 37 percent is expected for white-collar jobs and only 15 percent for blue-collar occupations. (See chart 1.) In 1985, white-collar workers are projected to number 53.7 million, up from 39.1 million in 1972, and to account for more than half (52.9 percent) of total employment. (See chart 2.) Blue-collar workers are expected to rise from 28.6 million in 1972 to 32.8 million in 1985; in 1985, they are projected to account for about one-third (32.3 percent) of the total work force, down from 35 percent in 1972. Service worker employment is expected to expand at about the same rate as total employment, rising from 11.0 million in 1972 to 13.4 million in 1985, and to account for about 13 percent of all workers. Farm workers are projected to decline from 3.1 million to 1.6 million over the 1972-85 period.[10]

Slowdown in growth. The annual rate of employment

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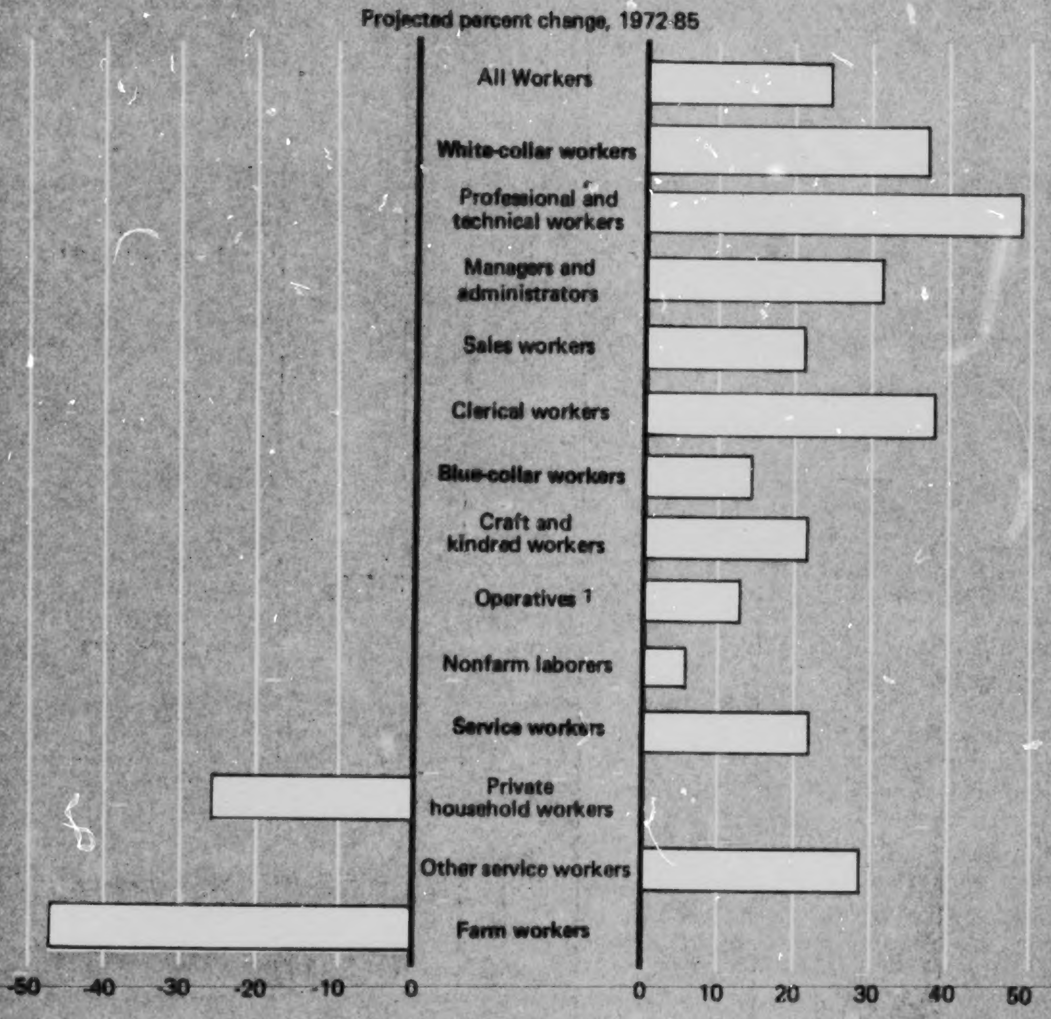
[9] Statistics on employment in this chapter are based on the concept used in the Current Population Survey in which each individual is counted once in his major occupation. The data for total employment here, therefore, differ from a count of jobs as presented in *The U. S. Economy in 1985*, BLS Bulletin 1809, and in the article by Ronald E. Kutscher in "The United States Economy in 1985," *Monthly Labor Review*, December 1973. Since one worker may hold more than one job, the job count in these publications is greater than that presented here. Additional differences between the totals occur because the job count is based primarily on data from a survey of establishments collected by State agencies in a cooperative program with the Bureau of Labor Statistics, and the count of individuals is based on a survey of households conducted by the Bureau of the Census for the Bureau of Labor Statistics. The reasons that cause the employment count to differ between these two surveys are indicated in "Comparing Employment Estimates from Household and Payroll Series," *Monthly Labor Review*, December 1969, pp. 9-20.

[10] This estimate for employment in agriculture is based on the Current Population Survey in which each individual is counted once in his major occupation.

Chart 1

Through the mid-1980's employment growth will vary widely among occupations



[1] Includes the 1970 Census classifications "operatives except transport" and "transport equipment operatives."

Chart 2

Employment is expected to continue to shift toward white-collar occupations.

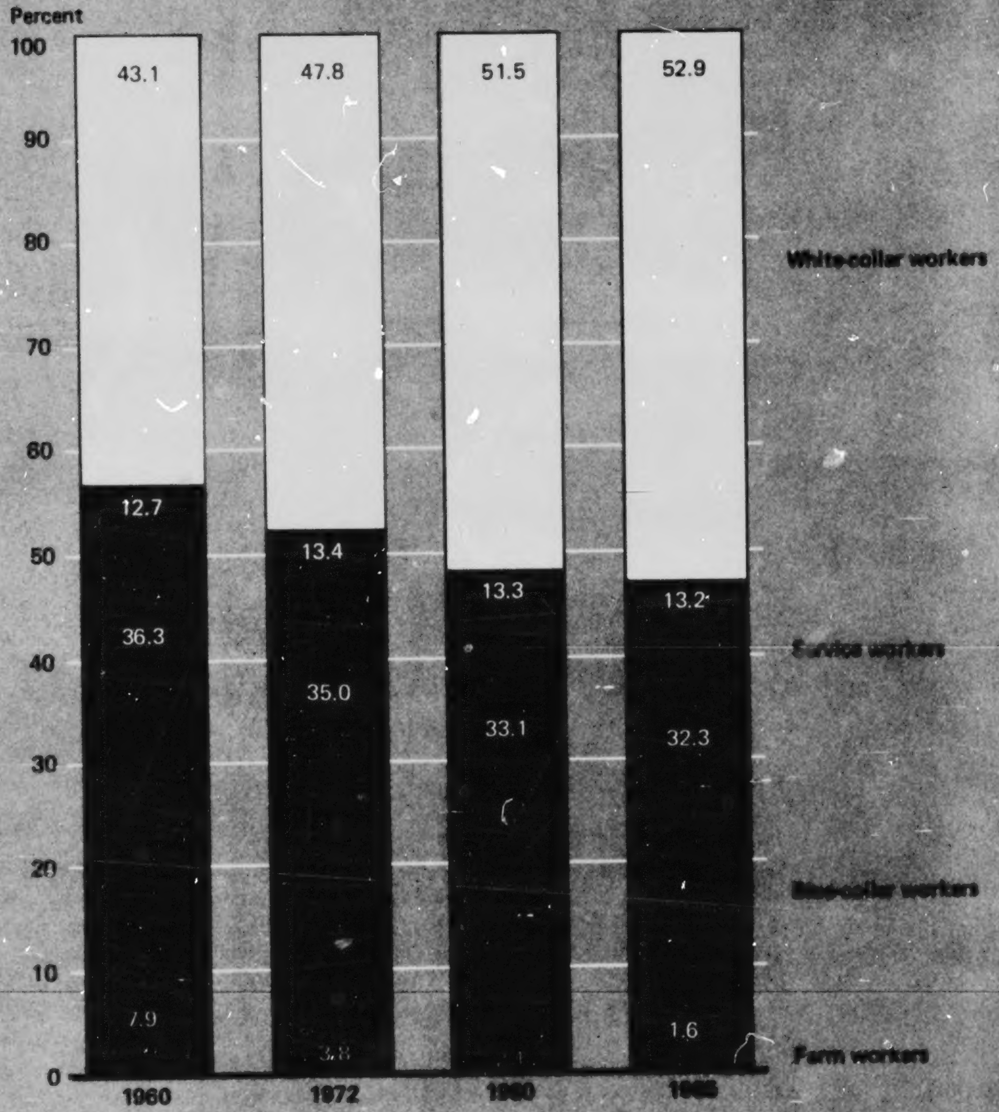


Table 2. Average annual rates of employment change, by major occupational group, 1960-72 and projected for 1972-85

[Percent]

Occupational group	1960-72	Projected		
		1972-85	1972-80	1980-85
Total	1.8	1.7	2.0	1.2
White-collar workers	2.7	2.5	3.0	1.7
Professional and technical workers	3.9	3.1	3.5	2.5
Managers and administrators	.7	2.0	2.8	.8
Salesworkers	2.0	1.5	2.1	.5
Clerical workers	3.4	2.5	2.9	1.9
Blue-collar workers	1.5	1.1	1.3	.7
Craft and kindred workers	1.8	1.4	1.6	1.2
Operatives	1.5	1.0	1.6	.5
Nonfarm laborers	1.0	.4	.7	0
Service workers	2.3	1.6	1.9	1.0
Private household workers	–2.6	–2.4	–1.7	–3.4
Other service workers	3.4	2.0	2.4	1.4
Farm workers	–4.5	–5.0	–5.4	–4.4

NOTE: All data reflect the occupational classification into major groups used in the 1970 census. "Operatives, except transport" and "transport equipment operatives" were combined into one group, "operatives."

growth will not be constant over the 1972-85 period. A rather sharp slowdown in the rate of growth is expected during the latter half of the period. The slowing stems from the effect of the growth of the population 16 years of age and over from which the labor force is drawn. For some time, the birth rate and the actual number of births have fallen from the peak period of the late 1950's and early 1960's. This slowdown in births and the birth rate will have the effect of reducing the number of annual new entrants to the labor force in the late 1970's.

This slowdown can be easily seen by comparing the change in the rate of growth of the major occupational groups in the 1972-80 period and the 1980-85 period. (See table 2.) Between 1972 and 1980 total employment is projected to grow at an annual rate of 2.0 percent. This rate of growth is expected to drop to 1.2 percent a year over the 1980-85 period. A similar trend is seen for all the major groups, with markedly different rates of growth in the two periods for salesworkers, managers and administrators, and operatives. These workers are concentrated in industries that would be heavily affected by a slowdown of the economy.

However, the effect of this slowdown is expected to be much less pronounced on job openings than on total employment. Job openings arise mainly from the need to replace workers who die and retire rather than from growth of total employment. Thus, despite the slowdown in the annual rate of growth in total employment from 2.0 percent to 1.2 percent, total openings are projected to be greater over the 1980-85 period than in 1972-80. The primary reason is that as occupations grow larger a greater number of persons die and retire each year who must be replaced just to keep employment at the same level. (See section on job openings later in this chapter for additional information.)

Growth trends in major groups

Professional and technical workers. Employment growth for professional and technical workers is expected to continue to be faster than for all other major occupational groups. The projected growth from 11.5 million in 1972 to 17.0 million in 1985 is more than one and one-half times the annual rate of increase projected for all occupations combined. (See table 2.) However, the projected 1972-85 rate of growth is slower than that between 1960 and 1972. A major factor is the expected slowdown in the growth of elementary and secondary school teachers and engineers (who accounted for over one-fourth of all professional workers in 1972) over the 1972-85 period. Growth in the teaching occupations is projected to slow as the rate of increase in the number of pupils will be much lower in the future period. Engineers, a group which grew rapidly in the 1960's largely as a result of expansion of space exploratory work and an increase in research and development activities, will experience a reduced rate of growth largely because such activities are not expected to rise as sharply as in the past. The annual rate of growth for professional and technical workers is expected to be slower between 1980 and 1985 (2.5 percent) than from 1972 to 1980 (3.5 percent) as the slowdown in the rate of growth of the economy also has its effect on this fast-growing group of workers. At 17.0 million in 1985, employment in this group is projected to represent 16.8 percent of total employment, up from 14.0 percent in 1972. (See table 3.)

The growth in demand for goods and services, resulting from population growth and rising business and personal incomes, will continue to be a major reason underlying the growth of these highly trained workers. As the population continues to concentrate in metropolitan areas, requirements are expected to increase for professional and technical workers to work in fields such as environmental protection, urban renewal, and mass transportation. Requirements for professional workers also should increase along with the continuing growth of research in the natural and social sciences, although the rate of growth in these activities as a whole is likely to slow from the very rapid pace experienced during the

Table 3. Employment by major occupational group, 1960, 1972, and projected for 1980 and 1985

[Numbers in thousands]

Occupational group	1960[1]		1972		1980		1985	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	65,778	100.0	81,703	100.0	95,800	100.0	101,500	100.0
White-collar workers	28,351	43.1	39,092	47.8	49,300	51.5	53,700	52.9
Professional and technical workers	7,236	11.0	11,459	14.0	15,000	15.7	17,000	16.8
Managers and administrators	7,367	11.2	8,032	9.8	10,100	10.5	10,500	10.3
Salesworkers	4,210	6.4	5,354	6.6	6,300	6.6	6,500	6.4
Clerical workers	9,538	14.5	14,247	17.4	17,900	18.7	19,700	19.4
Blue-collar workers	23,877	36.3	28,576	35.0	31,800	33.1	32,800	32.3
Craft and kindred workers	8,748	13.3	10,810	13.2	12,300	12.8	13,000	12.8
Operatives[2]	11,380	17.3	13,549	16.6	15,000	15.6	15,300	15.1
Nonfarm laborers	3,749	5.7	4,217	5.2	4,500	4.7	4,500	4.4
Service workers	8,354	12.7	10,966	13.4	12,700	13.3	13,400	13.2
Private household workers	1,965	3.0	1,437	1.8	1,300	1.3	1,100	1.1
Other service workers	6,387	9.7	9,529	11.6	11,400	12.0	12,300	12.1
Farm workers	5,196	7.9	3,069	3.8	2,000	2.1	1,600	1.6

[1] Data for 1960 were adjusted to reflect the occupational classification in the 1970 census to make them comparable to the 1972 and projected 1980 and 1985 data.

[2] Includes the 1970 census classifications "operatives, except transport" and "transport equipment operatives."

NOTE: Detail may not add to totals because of rounding.

1960's. The demand for professional workers to develop and utilize computer resources also is expected to grow rapidly in the 1972-85 period.

Managers and administrators. Employment of managers and administrators is projected to reach 10.5 million in 1985, up from 8.0 million in 1972. This represents a much higher average annual rate of growth than during the 1960-72 period. As a result, this group's share of total employment will increase from 9.8 percent in 1972 to 10.3 percent in 1985. However, a large part of the future growth reflects a catchup because little change in employment was experienced in these occupations between 1968 and 1972 although total employment increased. Between 1980 and 1985, however, the annual rate of growth (0.8 percent) is projected to slow considerably from the 1972-80 period (2.8 percent). This largely reflects the slowdown in the rate of growth of trade during that period. About two-fifths of all managers are employed in trade.

Changes in business size and organization have resulted in differing trends for salaried and self-employed managers. Requirements for salaried managers are expected to continue to grow rapidly as industry and government increasingly depend on trained management specialists. Technological development will contribute further to employment growth of these occupations. For example, an increasing number of technically trained managers will be needed to administer research and development programs and to make decisions on the installation and use of automated machinery and automatic data processing systems. The number of self-employed managers (proprietors) is projected to continue to decline as the trend toward larger firms continues to restrict growth of the total number of firms. The expansion of quick service grocery stores, self-service laundries and drycleaning shops, and hamburger and frozen custard drive-ins, however, is expected to slow the rate of decline.

Salesworkers. The anticipated expansion of trade is expected to increase the need for salesworkers. However, changing techniques in merchandising are expected to hold down some of the increase. Employment is projected to rise from 5.4 million in 1972 to 6.5 million in 1985, slower than the rate of increase expected in total employment. As a result, the share of total employment attributed to salesworkers is projected to decrease slightly from 6.6 percent in 1972 to 6.4 percent in 1985. The projected rate of growth is slower than that experienced by this group over the 1960-72 period. This is caused by the projected slower rate of growth of trade which employs over two-thirds of all salesworkers. The annual rate of growth of salesworkers is expected to be slower between 1980-85 than between 1972-80, also following the trend in employment in trade. As stores remain open longer and expand into suburban areas, an increase in demand is expected for retail salesworkers who account for about half of all workers in this major group. However, changes in sales practices such as increased use of self-service, checkout counters, and vending machines are expected to slow the increase.

Clerical workers. Employment in clerical jobs is expected to grow faster than total employment, rising to 19.7 million in 1985, up from 14.2 million in 1972. As a result, clerical jobs will become a larger share of total employment, growing from 17.4 percent in 1972 to 19.4 percent in 1985. Among the major occupational groups, only professional workers are expected to have a faster growth rate. Nevertheless, this rate of growth is slower than that experienced from 1960 to 1972. The annual rate of growth is projected to be slower in the 1980-85 period (1.9 percent) than from 1972 to 1980 (2.9 percent) largely because of a projected slowdown in the rate of growth of trade and manufacturing which, combined, employed about one-third of all clerical workers in 1972. However, the projected decline in the growth rate from the earlier to the later time period is expected to be less for clerical workers than for most major groups.

Clerical workers, the largest major occupational group in 1972, will be greatly affected by technology changes. Developments in computers, office equipment, and communication devices are expected to retard the growth of employment for some clerical occupations and increase the employment for others. For example, the use of electronic computers and bookkeeping machines to process routine and repetitive work is expected to reduce the use of clerks in jobs such as filing, payroll, inventory control, and customer billing. On the other hand, the number of clerical workers needed to prepare material for computers is projected to increase greatly.

Many types of clerical workers, however, are unlikely to be affected significantly by new technology. For example, secretaries, stenographers and typists, receptionists, and others who must meet the public should not be greatly affected. The increased use of secretaries, stenographers and typists, and receptionists in industries that employ large numbers of them, such as miscellaneous business services and legal services, is projected to account for 2.5 million growth between 1972-85 or about half of the total growth in the clerical group over this period.

Craft and kindred workers. Employment in the highly skilled craft occupations is expected to rise from 10.8 million in 1972 to 13.0 million in 1985, a slower rate of growth than over the 1960-72 period. Rising more slowly than total employment between 1972 and 1985, the share of total employment made up of craft occupations is expected to decline over the period, from 13.2 percent to 12.8 percent. A large part of this decline stems from the unusually large increase in construction craft workers and mechanics from 1971 to 1972, a rise from 12.9 to 13.2 percent of total employment. This produced a very high level of employment in 1972 and a projected increase from that year which is lower than the long-term trend.

The rising demand for these workers is expected to stem from the growth of the two major industry groups that employ large numbers of craft workers—manufacturing and construction. The growth of construction has a major effect on the growth in craft occupations because one-half the employees in this industry are in this group. Growth in requirements for construction craft workers is projected to account for about one-third of the total growth in the major group. Construction will increase as more businesses, plants, shopping centers, and utility plants are required. Manufacturing industries, in which about 1 in 5 is a craft worker, employ about the same number of craft workers as construction. Manufacturing employment will increase to provide more goods to an increasing population.

Operatives. Operative occupations account for more workers than any blue-collar group. Employment of operatives is closely tied to industrial production because of the concentration of these workers in industrial processing. Through the mid-1980's more sophisticated technological advances are expected to greatly slow employment growth in these occupations. Employment of operatives is projected to rise from 13.5 million in 1972 to 15.3 million in 1985, a much slower rate of increase than that expected for total employment. Consequently, the proportion of operatives relative to total employment is expected to slide downward from 16.6 percent in 1972 to 15.6 percent in 1980 and 15.1 percent in 1985. Between 1980 and 1985, employment of operatives is expected to grow very slowly, at 0.5 percent a year, about one-third the rate of growth expected over the 1972-80 period. This reflects the expected slowing of the manufacturing industry growth rate over the same period. Three of every 5 semiskilled workers in 1972 were employed as operatives in manufacturing industries. Large numbers were assemblers or inspectors, and many worked as operators of material moving equipment such as powered forklift trucks. Among the operatives employed outside of factories, drivers of trucks, buses, and taxicabs made up the largest group.

Nonfarm laborers. Employment requirements for laborers are expected to increase slowly between 1972 and 1985 despite the employment rise anticipated in manufacturing and construction, the two industries which, combined, employ two-fifths of all laborers. This reflects a change from the 1960-72 period when employment of laborers increased by nearly 1 percent a year. The share of total employment for these workers is expected to decline from 5.2 percent to 4.4 percent between 1972 and 1985.

Increases in demand for laborers are expected to be offset roughly by rising output per worker resulting from the continuing substitution of machinery for manual labor. For example, power-driven equipment such as forklift trucks, derricks, cranes, hoists, and conveyor belts will take over more of the handling of materials in factories, at freight terminals, and in warehouses. Other power-driven machines will do excavating, ditch digging, and similar work. In addition, integrated systems for processing and handling materials and equipment will be installed in an increasing number of plants.

Service workers. A growing population, expanding business activity, increasing leisure time, and rising levels of disposable personal income are the major factors underlying increased needs for service workers. This occupational group encompasses a wide variety of jobs and a wide range of skill requirements. It includes such diverse jobs as FBI agent, police officer, beauty operator, and janitor.

Employment of service workers is projected to rise from 11.0 million in 1972 to 13.4 million in 1985, a somewhat slower rate of growth than that projected for total employment. Employment of private household workers, however, who make up a large part of this major group, is projected to decline from 1.4 million to 1.1 million over this period. Service workers other than private household workers are expected to show a faster rate of growth than total employment.

The projected 1972-85 rate of growth of service workers including private household workers is slower than that experienced over the 1960-72 period. However, growth between 1960 and 1972 was greatly affected by the very rapid growth during the 1969-72 period. The projected 1972-80 growth rate is near that experienced over the 1960-69 period. Between 1980 and 1985, the growth rate is expected to be slower than in the 1972-80 period because of the projected slowdown of the rate of growth in the service industries, which employ about two-thirds of these workers.

Farm workers. Farm workers, who make up nearly 90 percent of all workers in agriculture, are expected to decline by nearly one-half, from 3.1 million in 1972 to 1.6 million in 1985. This represents a somewhat faster rate of decline than in the 1960-72 period. Their share of total employment also is expected to fall between 1972-85 from 3.8 percent to 1.6 percent. The annual rate of decline is expected to be slower between 1980 and 1985 (–4.4 percent) than from 1972 and 1980 (–5.4 percent).

Declining needs for farm workers will continue to be related to rising productivity on farms. Improved machinery, fertilizers, seeds, and feed will permit farmers to increase output with fewer employees. For example, improved mechanical harvesters for vegetables and fruits will decrease the need for seasonal or other hired labor. Developments in packing, inspection, and sorting systems for fruits, vegetables, and other farm products also will reduce employment requirements.

Net occupational openings

Projections of growth of occupations provide only a part of the estimate of future manpower requirements. Of greater importance is the demand for new workers created by replacement needs. Over the 1972-85 period about twice as many openings will result from replacements as from growth. Total openings arising from occupational growth and replacement needs will be about 61.2 million between 1972 and 1985, or an average of about 4.7 millions jobs to be filled annually through the period. Replacement needs will total 41.4 million, accounting for 2 of every 3 job openings; growth needs will total 19.8 million. (See table 4.)

Replacement needs will be a more significant source of job openings than job growth in each of the major occupational groups. Replacement needs are likely to exceed the average in those occupations that (a) employ many women, because large numbers leave the labor force each year to assume family responsibilities, and (b) have a large proportion of older workers who have relatively few years of working life remaining. However, in some occupations, growth requirements are likely to exceed those for replacement.

Many job openings also are created because of occupational shifts. For example, when a technician is upgraded to an engineer, a technician job opening is created. Of course, this shift also adds to the supply of engineers. Data for estimating transfer losses and gains generally are not available. Estimates of job openings in this bulletin, therefore, do not include transfers except for some professions for which data are available. Such cases are specifically noted. Some headway is being made in developing data on occupational mobility from the 1970 Decennial Census but time constraints have not allowed that data to be analyzed for use in this bulletin.

The data on job openings presented for individual occupations in this bulletin are in terms of average annual openings rather than for the 1972-85 period as a

Table 4. Projected requirements and job openings for major occupational groups, 1972-85

[Numbers in thousands]

Occupational group	1972 employment	Projected 1985 requirements	Percent change	Openings, 1972-85		
				Total	Growth	Replacement
Total	81,703	101,500	24.2	61,200	19,800	41,400
White-collar workers	39,092	53,700	37.3	38,800	14,600	24,200
Professional and technical workers	11,459	17,000	48.8	12,000	5,600	6,400
Managers and administrators	8,032	10,500	30.1	5,900	2,400	3,500
Salesworkers	5,354	6,500	21.3	3,800	1,100	2,700
Clerical workers	14,247	19,700	38.2	17,000	5,400	11,600
Blue-collar workers	28,576	32,800	14.7	13,800	4,200	9,600
Craft and kindred workers	10,810	13,000	20.2	5,300	2,200	3,100
Operatives	13,549	15,300	13.1	7,200	1,800	5,500
Nonfarm laborers	4,217	4,500	5.9	1,300	200	1,000
Service workers	10,966	13,400	22.2	8,500	2,400	6,100
Private household workers	1,437	1,100	−26.1	700	−400	1,100
Other service workers	9,529	12,300	29.0	7,800	2,800	5,000
Farm workers	3,069	1,600	−47.1	100	−1,400	1,500

NOTE: Detail may not add to totals because of rounding.

whole, for ease of comparison with training data. The average openings data were developed by dividing projected openings for the entire 1972-85 period by 13. As indicated earlier, a slowdown in the rate of growth from the 1972-80 period to the 1980-85 period can be expected, but little effect will be felt on average openings because of the great weight of replacement needs on total job openings.

Chapter 3. The Status Of Occupational Training

Each year occupational training is needed by millions of young people who must bridge the gap between school and work, persons whose skills have become obsolete because of new technology, and the disadvantaged who need to qualify for entry level jobs and progress up the occupational skill ladder.

As was shown in the preceding chapter, the Nation increasingly is shifting from blue-collar to white-collar jobs–jobs that require higher levels of education and skill acquired through formal training. Furthermore, an increasingly large proportion of blue-collar workers will be craft workers who require more training than other blue-collar workers. As these shifts continue into the future, the need for specialized training will apply to more jobs than ever before. In addition, the goals of occupational training are being broadened to include more than specific training for a job; training should facilitate workers' adaptation to the constantly changing demands of their jobs or the labor market.

This chapter discusses available training for occupations. It covers:

- Vocational education
- Apprenticeship programs
- Employer training
- Armed Forces training
- Federal manpower programs
- Home study courses
- Junior colleges or community colleges
- College and university training

The discussions of occupational training cover topics such as the nature of training programs, available data on training, uses of data for supply-demand analysis, and problems associated with using the data. Specific training needed to enter each of 240 detailed occupations is duscussed in chapter 4 along with related statistics and data on manpower requirements. Appendix C presents statistics on training for each detailed occupation.

In addition to the information on training presented in this report, a recent BLS study[11] provides an in-depth discussion of ways to analyze training statistics and other data on occupational supply for vocational guidance and education planning purposes. That study also presents a detailed bibliography of data sources.

Vocational education

The origin of vocational education in public schools in the United States can be traced to the Smith-Hughes Act of 1917, whose influence can be seen throughout the many vocational education acts and amendments in later years. Legislation on vocational education such as the George-Barden Act (1941) and the Vocational Education Act of 1963 and its 1968 amendments not only provided for expanded educational coverage and expenditures, but made changes in the emphasis of vocational education. For example, the George-Barden Act called for expanded occupational training and increased expenditures for vocational education; the Vocational Education Act of 1963 provided for research and construction for the first time; and the 1968 amendments added new programs and money, while changing the philosophical emphasis of vocational education to focus on services offered to meet the needs of individuals rather than specific occupational areas. The 1968 amendments stated that "persons of all ages in all communities of the State . . . will have ready access to vocational training which is high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and abilities to benefit from such training."[12] Thus, the Vocational Education Act of 1963 and its 1968 amendments not only provided for increased enrollments and expenditures but improved the quality and expanded the scope of vocational programs.

Types of training available. In its beginnings vocational education emphasized agricultural and trade and industrial education which evolved over time to include courses in many occupational areas or programs such as distributive occupations, health, home economics, and office occupations. Consumer and homemaking training is another area of training, but the relation between training and an occupation is not as specific in this field as in the other fields of training. Special programs providing training for the disadvantaged and handicapped also were included.

Vocational education is specialized and emphasizes

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[11] *Occupational Supply: Concepts and Sources of Data for Manpower Analysis*, Bulletin 1816 (Bureau of Labor Statistics, 1974).

[12] Public Law 91-576, 90th Cong., H.R. 18366, October 16, 1968 Amendments to the Vocational Education Act of 1963, p. 829.

on-the-job training. Specific curriculums are offered that are designed to prepare workers for specific occupations. Table 5 shows some examples of instructional courses and occupations.

Table 5. Examples of curriculums offering training for specific occupations

Vocational technical program	Instructional course	Occupation
Agriculture	Agricultural mechanics	Farm equipment mechanic
	Ornamental horticulture	Tree surgeon
	Forests	Fire warden
Distribution	Floristry	Floral designer
	Food services	Food checker
	Recreation and tourism	Recreation director
Health	Dental assisting	Dental assistant
	Medical lab assisting	Medical lab assistant
	Occupational therapy	Occupational therapy aide
Home economics	Care and guidance of children	Child care attendant
	Home furnishing, equipment, and services	Slipcover cutter
	Clothing management, production, and services	Wardrobe attendant
Office	Peripheral equipment operator	High-speed printer operator
	Secretaries	Legal secretary
	Quality control clerk	Claim examiner
Technical	Commercial pilot training	Commercial airplane pilot
	Food processing technology	Laboratory tester
	Petroleum technology	Cable driller
Trades and industry	Body and fender repair	Shop estimator
	Airframe repair	Assembly mechanic
	Product design	Package designer

Enrollments. Vocational education grew rapidly after the passage of the Vocational Education Act of 1963; further growth was spurred by the amendments of 1968. In fiscal year (FY) 1972, 11.6 million persons were enrolled in federally aided vocational-technical education programs (table 6), an increase of 10 percent over the 10.5 million enrolled in FY 1971, and more than double the number enrolled in 1965.[13]

In FY 1972 vocational education increased on all levels. Persons enrolled in secondary programs increased by 740,000 to 7.1 million, or more than 11 percent from 1971 to 1972; postsecondary programs rose by 163,000 to 1.3 million, or more than 14 percent; and adult programs rose by 207,000 to 3.1 million or over 7 percent.

Of the approximately 11.6 million enrolled in 1972, 1.6 million disadvantaged persons and more than 200,000 handicapped persons received special services to help them succeed in vocational education. Among the eight major categories of vocational education curriculums, the consumer and homemaking program had the largest enrollment, 3.2 million, with the office program and the trade and industry program following with 2.4 million each. (See table 7.) Home economics and health enrollments increased by the largest percentages, by 42 and 25 percent, respectively, from 1971.

Specific instructional programs with the largest enrollments in 1972 were: typing and related skills (628,414), agricultural production (564,155), stenography, secretarial, and related skills (550,686), filing and office machines (398,226), accounting and computing (351,861), metalworking occupations (291,661), auto mechanics (228,364), general merchandise

Table 6. Enrollments in vocational education, by level, fiscal year 1972

Level	Number	Percent distribution
Total	11,602,144	100.0
Secondary	7,231,648	62.3
Postsecondary	1,304,092	11.2
Adult	3,066,404	26.4

SOURCE: United States Department of Health, Education, and Welfare, Office of Education.

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[13] Data on enrollments generally refer only to federally funded programs. Because of changes in definitions and reporting requirements, data are not strictly comparable from year to year. Comparisons should be considered approximate.

Table 7. *Enrollments in vocational education, by program, fiscal year 1972*

Program	Number	Percent distribution
Total	[1] 11,602,144	100.0
Agriculture	896,460	7.7
Distribution	640,423	5.5
Health	336,652	2.9
Home economics (gainful)	279,966	2.4
Office	2,351,878	20.3
Technical	337,069	2.9
Trades and industry	2,397,968	20.7
Consumer and homemaking	3,165,732	27.3
Other programs	[2] 1,304,619	10.3

[1] Unduplicated.

[2] Includes prevocational, prepostsecondary, remedial, and other not elsewhere classified. Some overlapping with other programs.

SOURCE: Department of Health, Education, and Welfare, U.S. Office of Education.

(204,681), firefighter training (159,307), business data processing systems (156,748), agricultural mechanics (128,000), and drafting occupations (126,750).

Completions and placements. Of the 930,000 persons who had completed vocational education programs in FY 1972, approximately 548,000 were available for placement—297,000 at the secondary level, 139,000 at the postsecondary level, and 111,000 at the adult level. Of the 258,000 who reported their status as not available for placement, 71 percent continued school full time. About 124,000 or 13 percent of persons who completed a program did not report or their status was unknown.[14]

Of the graduates of secondary, postsecondary, and adult programs available for placement in 1972, about 76 percent obtained employment in the field for which they were trained or in a related field, while 16 percent were employed in other fields and 8 percent were unemployed.

Private vocational schools. Private vocational schools prepare students for employment in many occupational areas; in 1971, 6,135 of these schools and institutes were accredited in the United States. The largest number of accredited schools were cosmetology schools (1,477); flight schools (1,342), vocational, technical, and trade schools (1,174); hospitals (1,016); and business/commercial schools (962).

Private vocational schools vary in enrollment from under 50 to over 2,000 students. Types of programs and courses offered vary. Some business schools, for example, offer courses in shorthand, typing, stenography, and fundamentals of accounting, while others may offer only one curriculum. Trade schools may offer programs in auto mechanics, barbering, locksmithing, radio-TV broadcasting, and truckdriving. The programs in other schools vary from commercial art and aircraft mechanics to paramedical occupations and fashion design. Information on the number of enrollments by program and the number of graduates of private vocational schools is not available at present.[15]

Apprenticeship programs

Formal apprenticeship training regulates the teaching of specified skills and related knowledge on the job and in the classroom. Most training authorities recommend formal apprenticeship training as the best way to acquire all-round proficiency in a skilled craft. Apprenticeship training provides the apprentice with a thorough knowledge of his trade and enables him to perform most tasks completely. Most studies indicate the apprenticeship programs train the most highly skilled workers and a significant proportion of future foremen and supervisors.[16]

Most apprentices are trained in programs in which employers and local trade unions participate in a joint apprenticeship committee. Such committees interview applicants, review the trainee's progress, and determine when an apprenticeship has been completed satisfactorily. Most apprenticeship programs are registered with Federal or State apprenticeship agencies, but sponsors are not required to do so. No estimate is available of the number of apprentices in programs that are not registered.

The Department of Labor's Bureau of Apprenticeship and Training (BAT) registers but does not finance apprenticeship programs. BAT provides technical assistance and support to State apprenticeship agencies and to employers and unions in establishing and maintaining apprenticeship programs. In addition, BAT maintains records of new registrations, completions, and cancellations of apprenticeship for each apprenticeable trade by State.[17] Of the 264,000 registered apprentices at the end of 1972, 61 percent were in construction trades, 11 percent in metalworking, 5 percent in printing, and the remaining 23 percent in a miscellaneous trades category.

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[14] *Summary Data Vocational Education, Fiscal Year 1972*, U.S. Office of Education. Completion and placement data cannot be compared with enrollment data because California, Colorado, Hawaii, Indiana, Kentucky, Minnesota, Missouri, New York, Ohio, Pennsylvania, American Samoa, Puerto Rico, and the Virgin Islands did not report completions and placements.

[15] Information will be available in late 1974 from The Adult and Vocational Education Survey Branch, Office of Education, U.S. Department of Health, Education, and Welfare.

[16] U.S. Department of Labor, Bureau of Apprenticeship and Training, *Career Patterns of Former Apprentices*, Bulletin No. T-147, March 1959. (See page 4 and chart 2 and table 3.)

Table 8 records apprenticeship registration actions from 1960 to 1972. Since the mid-1960's, apprenticeship registrations have increased significantly. A general interest in training more skilled craftsmen to meet future manpower requirements has become a common goal for employers, unions, and government manpower officials.

Apprenticeship cancellations (see table 8) represent a loss of potentially highly trained workers. This loss is not as serious as it appears, however, since many apprentice dropouts eventually become skilled journeymen through less formal means. Many apprentices drop their apprenticeship because of the opportunity to work at the journeyman level.[18] Apprenticeship cancellations increase when jobs are plentiful because trainees have the opportunity to earn journeyman wages. On the other hand, apprentices remain in training longer and are more likely to complete their apprenticeship when jobs are not quite so plentiful.

Employer training

Employer training provides the opportunity to learn many occupations on either a formal or informal basis, with skill acquisition usually taking place on the job. In both skilled and semiskilled occupations, there are at least three on-the-job training paths *apprenticeship, formal on-the-job instruction*, and *learning by doing*. Apprenticeship programs, discussed in the preceding section, represent formal employer training with skill acquisition acquired through on-the-job training in conjunction with related classroom instruction. Formal on-the-job instruction takes place in the shop and may range from fairly programmed instruction by designated instructors to casual instruction from foremen and fellow employees. The distinction between on-the-job training programs and "learning by doing" is often difficult to make.

In most instances, training takes place informally within the work environment. Most workers, according to a study on occupational training conducted in 1963 by the Department of Labor, had "just picked up" their current skills informally on the job.[19] Because of the

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[17] Annual copies of *Apprentice Registration Actions, by Region and State*, can be obtained from Division of Reporting Operations, Manpower Administration, U.S. Department of Labor, Washington, D.C. 20210. In addition, the annual *Manpower Report of the President*, U.S. Department of Labor, contains a tabulation on the training status of registered apprentices.

[18] *Apprentice Dropouts in the Construction Industry* (U.S. Department of Labor, Bureau of Apprenticeship and Training, December 1960), pp. 6-9.

[19] *Formal Occupational Training of Adult Workers*, Manpower/Automation Research Report No. 2 (U.S. Department of Labor, December 1964).

Table 8. Training status of registered apprentices in all trades, 1960-72

Year	In training at beginning of year	Apprentice actions during year			In training at the end of year
		New registrations and reinstatements	Completions	Cancellations[1]	
1960	172,161	54,100	31,727	33,406	161,128
1961	161,128	49,482	28,547	26,414	155,649
1962	155,649	55,590	25,918	26,434	158,887
1963	158,887	57,204	26,029	26,744	163,318
1964	163,318	59,960	25,744	27,001	170,533
1965	170,533	68,507	24,917	30,168	183,955
1966	183,955	85,031	26,511	34,964	207,511
1967	207,511	97,896	37,299	47,957	220,151
1968	[2]207,517	111,012	37,287	43,246	237,996
1969	237,996	123,163	39,646	47,561	273,952
1970	[2]269,626	108,779	45,102	53,610	279,693
1971	[2]278,431	78,535	42,071	40,891	274,004
1972	[2]247,840	103,527	53,059	56,750	264,122

[1] Includes voluntary quits, layoffs, discharges, out-of-State transfers, upgrading within certain trades, and suspensions or interruptions for military service.

[2] The difference from the number in training at the end of the previous year reflects changes or revisions in the reporting system.

SOURCE: U.S. Department of Labor, Bureau of Apprenticeship and Training.

informal nature of most employer training, it is difficult to define and measure on-the-job training. For example, many American workers become highly skilled by observing fellow workers, practicing in spare moments such as lunch hours, coffee breaks, or other periods, and by simply asking questions of experienced workers.

Since a large portion if not most of the occupational training for manual jobs occurs in private industry, the lack of data on training in the private sector hinders proper manpower analysis. The Bureau of Labor Statistics, with the support of the Manpower Administration, conducted a pilot survey in 1971 and 1972 to test the feasibility of collecting data on enrollments and completions of occupational training in selected industries, and to determine the best method of collecting such data. The results were generally positive and the Bureau has underway a nationwide, full-scale survey of occupational training in selected metalworking industries.

Armed Forces training

The Armed Forces represents one of the Nation's largest sources of trained manpower. The military training programs can be classified in one of six categories: recruit training, specialized training, officer training, officer acquisition training, professional training, and flight training. In numbers as well as influence on occupational skills, specialized training is the most important.

Specialized training includes courses that provide the serviceman with the skills needed to perform specific jobs in technical areas such as radio communication and jet engine repair as well as administrative and service-related specialties such as clerical work and military police duty.

The impact of specialized training is most clearly reflected by the occupational distribution of the Armed Forces.[20] The number of enlisted personnel in each of nine major occupational groups as of December 31, 1972, is shown below:

Infantry, gun crews, and seamanship specialists	236,877
Electronic equipment repairmen	200,495
Communications and intelligence specialists	136,760
Medical and dental specialists	86,472
Other technical and allied specialists	36,573
Administrative specialists and clerks	360,701
Electrical and mechanical equipment repairmen	414,648
Craftsmen	99,089
Service and supply handlers	225,360
Total	1,796,975

The preceding tabulation shows that the skills of enlisted servicemen are heavily concentrated in fields that demand mechanical or technical skills. Thus, the military is a major potential source of trained civilian workers in these fields.

It is difficult to determine from the Armed Forces listings the transferability of military to civilian skills. For example, the Air Force occupation Navigation/Bombing Trainer and Flight Simulator Specialist appears to have no relation to a civilian occupation. However, studies indicate that the skills necessary for this service occupation are highly related to those needed by electronics technicians. In an effort to "translate" military job titles, the Department of Defense, Office of the Assistant Secretary of Defense for Manpower and Reserve Affairs, has compiled the *Military-Civilian Job Comparability Manual*. The manual consists of two major sections. The first lists individual military job specialties with separate divisions for each service branch and relates them to civilian occupations that are either "highly" and "substantially" related. A second section, essentially the inverse of the first, presents civilian job categories and follows with all related military specialties. Although intended as a guide for employers and vocational counselors in job placement for the veteran, the manual can serve as a useful tool for manpower analysis.

Project Transition. A training and counseling program throughout the Armed Forces, Project Transition prepares service personnel who have between 1 and 6 months left in the service for employment in civilian life. From January 1968 to February 1972, 1.3 million persons received counseling under this program. For those without adequate training in civilian job areas, occupational training is offered in well over a hundred technical and skilled areas; about 223,000 persons received such skill training as of February 1972.

Only limited information is available on the success of service personnel in gaining immediate postservice employment in the specialties for which they were trained. According to Department of Defense estimates, job placements range from 50 to 70 percent.

There is no single listing of all training courses offered under Project Transition; courses offered are dependent on factors such as the facilities of the individual training base and the business activities of participating firms in private industry. Statistics on the number of persons trained by occupational area can be obtained only through the local training bases in the Transition program. Local manpower planners may be able to obtain these data by contacting Project Transition offices at military bases within the geographic scope of their research.

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[20] Detailed statistics providing estimates for each of the 67 specific occupational subgroups are presented in appendix table C-6.

Federal manpower programs

The Federal Government has sponsored manpower training programs on a formal basis since the enactment of the Manpower Development and Training (MDTA) Act in 1962 and the Economic Opportunity Act (EOA) in 1964. Starting in fiscal year 1975, most Federal manpower training funds will be distributed to State and local governments under the Comprehensive Employment and Training Act (CETA) of 1973. Three programs, the Job Corps, Migrant Labor, and Work Incentive (WIN), will continue as Federal rather than State and local programs.

Under CETA, about 500 jurisdictions (cities, counties, or States) of 100,000 population or more will receive funds directly, according to their needs as reflected in their population size, unemployment, and poverty levels. The State and local areas will determine how the money should be spent: whether on institutional training, on-the-job training, work experience, or direct placement into transitional public service jobs. Organizations planning training programs must negotiate with their local jurisdictions, called "prime sponsors," for inclusion in local plans for funding.

Data will be available from records which must be maintained by local jurisdictions on how many persons are enrolled in various training programs. There will be no advance information, at least on the Federal level, on how many persons will be trained for specific occupations.

Training data presented in this report are based on the Federal categorical programs: MDTA on-the-job training, MDTA institutional training, Neighborhood Youth Corps, and Public Service Careers Program. Other programs covered include JOBS, WIN, Job Corps, and Migrant Labor.

MDTA on-the-job training (OJT), which includes the Jobs Optional Program (JOP), is designed to equip workers with entrance-level skills and is carried out on the job site by the employer. These programs also provide remedial training for the underemployed and those subject to job displacement under the JOBS-NAB effort. In 1973, 127,000 persons were enrolled in MDTA on-the-job training programs. Detailed data are not available on the exact occupations for which persons were trained, but it is estimated that about two-thirds were involved in processing, machine trades, bench work, and structural work. In OJT and JOP combined, out of 59,600 ending training, there were 31,200 who completed the training program (about 63 percent).

In fiscal year 1973, about 95,000 persons were enrolled in *MDTA institutional training* programs; nearly 40,000 completed training. The number completing training for each specific field is shown in appendix C. There were about 9,100 trainees enrolled in industrial production and related occupations, 6,300 in office occupations, 2,500 in service occupations, 1,800 in construction occupations, over 7,600 in mechanic and repairman occupations, and over 2,600 in medical occupations. About four-fifths of persons completing institutional training in FY 1973 found jobs in the field for which they were trained.

The *Neighborhood Youth Corps* (NYC) of EOA was not designed primarily to train workers, but to help young persons from low income families stay in school, return to school, or increase employment possibilities. NYC provides work experience and, in some cases, related training. In 1973 more than 625,000 persons were enrolled in the Neighborhood Youth Corps: 165,300 in the in-school program, 74,700 in the out-of-school program, and 388,400 in the nine-week summer program. Detailed information on fields of training is not available.

The *Public Service Careers program* (PSC) of EOA was designed to develop entry-level jobs in government service agencies for disadvantaged workers and to help upgrade government employees who are in dead-end, low-paid positions. In general, under this program a government agency hires and trains persons on the job, while PSC funds pay the extra costs of training and supportive services, such as child care and transportation. The theory behind PSC was that lowering personal and institutional barriers can enable disadvantaged persons to perform satisfactorily in useful public service jobs. As with the JOBS program, which also operates under the "hire now, train later" concept, this program is not as attractive to agencies in periods when a sufficient supply of qualified labor is already available.

In fiscal year 1973, 47,200 persons participated in the public service careers program, a decrease from 58,301 in 1972. Most were employed in professional, technical, management, clerical, sales, and service occupations. There are not sufficient data to determine entry rates to specific occupations. Limited data have shown that PSC enrollees have turnover rates similar to those for regular employees. PSC placements as a percent of terminations[21] was about 73 percent.

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[21] Terminations include successful completions, dropouts, and early voluntary withdrawals.

Job Opportunities in the Business Sector (JOBS) program. Under the sponsorship of the National Alliance of Businessmen (NAB), trainees in this program are hired as on-the-job trainees, then given counseling, remedial and basic education, and other supportive services for permanent jobs and opportunities for advancement. The Department of Labor defrays expenses for training and supportive services. The National Alliance of Businessmen, formed as a private, nonprofit corporation to stimulate private firms to hire and train disadvantaged persons, provides the job and training opportunities in the private business sector among its members and nonmembers, with or without Federal funds. The program was built on the premise that immediate placement in jobs at regular wages, followed by training and supportive services, provides superior motivation for disadvantaged persons.

In 1973, 51,500 persons were hired under JOBS contracts with the Department of Labor, bringing the total enrollment since the inception of the program to 364,500. According to a General Accounting Office study, the retention rate for the program through June 1970 was 47 percent.[22] It is difficult to interpret this information, however, because there is no way to separate terminees who completed training from those who did not. About 14 percent of those in JOBS programs were in clerical and sales occupations; 60 percent were in processing, machine trades, bench work, and structural work.

Work Incentive (WIN) program. This program stresses economic independence for all employable persons age 16 and over in families receiving Aid to Families with Dependent Children. Originally a voluntary program , in July 1972 WIN became WIN II and is now mandatory for all AFDC recipients except those officially exempted by amendments to the Social Security Act. Unlike the earlier program, WIN II places less emphasis on training and seeks to refer welfare recipients directly to jobs. Where training is required, it is to take place at the job site wherever possible.

The individuals who register for WIN are counseled by the local welfare agency about typical job tasks and aided in making an occupational choice. At this point they may be referred to an unsubsidized job, a work experience program (OJT in private industry or a subsidized job in public or private nonprofit agency), or a formal skill training program. About 356,000 persons were served in FY 1973 and 148,200 placed in jobs. Limited data indicate that most WIN II participants are placed in clerical and service jobs. Specific data that can be used for occupational supply and demand analysis are not available.

Job Corps. The Job Corps trains high school dropouts between 16 and 21 years of age who have records of low educational achievement, have been out of work for at least 3 months, or can benefit from full-time residential assistance. The program provides young persons with basic educational and vocational skill training. The Job Corps is different from other Federal manpower programs in that centers provide residential living and serve their enrollees 24 hours a day, 7 days a week. Centers vary in size from 150 to 2,400 corps members, may be urban or rural, and may serve men or women.

For the year ending June 30, 1973, 66,100 corps members were served in 65 centers in 35 States and Puerto Rico. Training is provided in various fields, including clerical-sales, service, forestry, farming, food service, auto and machine repairs, construction trades, electrical appliance repair, industrial production, and health occupations.

It is extremely difficult to use Jobs Corps data to determine entrants to occupations because much Job Corps training is remedial education in basic reading and mathematical skills and not related to specific occupations. In 1973, almost 14,000 Job Corps members were placed in jobs; of these about 5,000 were placed in the field for which they were trained. The number of persons trained in specific fields is shown in appendix C.

Migrant labor. Until new guidelines are issued under CETA, little current information is available concerning the migrant labor program. However, in general, the program assists migrants by providing institutional training, work experience, on-the-job training, family services, and specialized relocation assistance.

Home study courses

In 1972, more than 5 million persons were enrolled in home study (correspondence) courses. Home study courses vary in length, intended academic level, and degree of specialization, and include academic instruction, vocational training, and personal enrichment programs. These courses are primarily useful for persons already employed, in the Armed Forces, living in rural areas, or for people who cannot leave home for institutional training. Home study schools are accredited by the National Home Study Council.

In 1970 over 1.8 million students were enrolled by home study private schools; almost 2.2 million through the Federal Government and the military services; over 300,000 by religious schools; and almost 70,000 in home study courses related to business and industrial training.[23]

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[22] U.S. General Accounting Office, Report to the Congress by the Comptroller General of the United States. *Evaluation Results and Administration of the Job Opportunities in the Business Sector (JOBS) Program in Five Cities*, B-163922, (Dept. of Labor, March 24, 1971), p. 13.

It is impossible to use information about home study to determine the number of entrants to specific occupations. There are neither detailed surveys on home-study occupational training, nor followup studies on entry rates for persons trained. Not all students complete the courses they begin and some of the training is a part of employer training programs. Thus, even if statistical information on completions were available, the data would not represent new entrants to an occupation.

Community and junior colleges

A variety of educational functions are served by community colleges. For some students they provide the first 2 years of academic training leading to a bachelor's degree. These colleges also offer adult education courses, many of which are geared to vocational preparation or improvement, and they offer career education programs designed to prepare students for entry into specific occupations.

Junior colleges have a large number of programs designed to prepare students for employment immediately after graduation. Although the typical program lasts 2 or more years, a number of courses require only 1 year for completion. Types of career education are: business and commerce technologies; data processing technologies, including computer maintenance as well as operation and programming; health services and paramedical technologies; mechanical and engineering technologies; natural science technologies; and public-service-related technologies such as law enforcement.

In both number of institutions and enrollments, community or junior colleges have experienced very rapid growth during the 1960's. According to data provided by the American Association of Community and Junior Colleges, the number of schools in operation grew by about 60 percent from 1960 to 1970. Enrollments in these institutions grew much faster, reaching well over 3 1/2 times the 1960 level.

The Office of Education compiles data each year on associate degrees and other awards below the baccalaureate through the Higher Education General Information Survey (HEGIS). These data represent all such awards granted, including 2- and 3-year degree programs offered by 4-year colleges. The proportion of degrees awarded by 2-year colleges generally has been over 80 percent of the total.

Between July 1, 1970, and June 30, 1971, the time frame of the most recent survey for which data are available, 307,880 associate degrees and other awards below the baccalaureate were granted in the United States. Approximately half were in curriculums designed to provide occupational competence at the technical or semiprofessional level.

The data provided by the Office of Education are in some cases segregated by relatively broad curriculum areas. For example, according to the latest survey, 5,017 awards were granted in "General data processing technologies." In the absence of detailed descriptions of the curriculum content leading to these awards, their treatment as potential supply in more narrowly defined occupations such as computer operator, peripheral equipment operator, or programmer has some weaknesses. However, in most instances, meaningful estimates of the supply-demand situation for occupations can be made by grouping the more narrow occupations to construct comparatively broad ranges of career specialties. The junior college degrees are related to specific occupations and are presented in appendix C.

The classification structure used by the Office of Education in collecting data on degrees awarded by curriculum has undergone some changes since the 1965-66 survey. The most significant is the new HEGIS taxonomy[24] that increases the number of curriculums identified separately. The new classification interrupts the precise accumulation of historical data on associate degrees and other formal awards below the baccalaureate. In fact, there are only three years of data on awards below the baccalaureate which are comparable. These are for the periods 1967-68, 1968-69, and 1969-70. However, appendix table C-1 presents, where possible, awards by curriculum from the current survey (1970-71) with data from the previous three years.

Projections of degrees awarded below the baccalaureate are not available and are a critical missing element in supply-demand analysis of specific occupational fields. Statistics are also unavailable on the projected composition of State and local junior college enrollments by curriculum or full or part-time status. However, several State administrators of junior college systems have compiled historical data on these and other topics. For example, past experience in Illinois suggests that future junior college enrollments in that State may include greater proportions of students in career-oriented curriculums as well as increases in part-time enrollment and adult education. Local manpower planners can contact State junior college administrators for such information to aid in assessing future State educational needs.

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[23] Information based on data supplied by the National Home Study Council, Washington, D.C.

[24] For a manual describing the new taxonomy and its relationship to the original, consult *A Taxonomy of Instructional Programs in Higher Education*, OE-500064-70 (U.S Department of Health, Education, and Welfare, Office of Education, 1970).

College and university training

College training covers a wide range of subjects–the social sciences, humanities, education, physical sciences, mathematics, medicine, engineering, the arts, biological science, and business. The general length of training is 4 years for most degree programs, but professional training may require another 4 years or more.

In 1972, there were 1,716, 4-year institutions of higher learning. According to the Office of Education, 456 were public and 1,260 were private institutions. Since 1965 about 130 new 4-year institutions were established, an increase of 10.2 percent. During this period Federal funds have more than doubled, from over $2 billion in 1965 to $4.8 billion in 1972.

Enrollments in colleges and universities have increased every year for the last 27 years. In 1972, 6,473,000 persons were enrolled in degree credit programs in 4-year institutions, an increase of 1,788,000 (38.2 percent) over the 4,685,000 enrollments in 1965.

The enrollment figure represent the number of people who attend college but not those who earn degrees. In 1972, 941,000 persons earned bachelor's degrees, 50,200 earned first professional degrees, 251,000 earned master's degrees, and 34,400 earned doctorates.

The number of earned degrees rose substantially from 1965 to 1972. Bachelor's degree recipients increased 81 percent from 520,300 in 1965 to 941,000 in 1972. First professional degree recipients increased by almost two-thirds (63 percent) from 30,800 in 1965 to 50,200 in 1972. The number of master's degrees awarded grew by 110,900 or 79 percent from 140,500 to 251,400 in 1972. Doctorates almost doubled (89 percent), from 18,200 to 34,400. The statistics on enrollments and earned degrees are comparable and consistent over time. Earned degree statistics by curriculum are presented in appendix C.

Followup studies. Followup data consist of occupational entry rates for individuals who have completed various types of college training. Entry rates are calculated as the percentage of persons with a specific undergraduate degree who entered an occupation related to the degree.[25] The question of sex is significant in analyzing followup data, for entry rates usually differ widely between men and women.

Entry rates to occupations related to the specific training are generally less than 100 percent and vary widely from occupation to occupation. Professional occupations such as dentists, podiatrists, veterinarians, and physicians have rates close to 100 percent. On the other hand, mathematicians, life scientists, and the social science professions have entry rates under 40 percent.

Many people do not enter the occupation corresponding to their undergraduate major. Entry rates under 100 percent are accounted for in this manner. Most occupations do not require such specific training. For example, some occupations require some knowledge in an area, but not a specialty. Bank officers and credit officials have no specific training, but in general have some business training. Persons who majored in the social sciences have made a wide variety of career choices. Many go into law, business, teaching, or public administration. In some areas such as engineering where a large majority of the undergraduates enter the occupation, possible alternatives still are common. For example, an engineer with a law degree may become a patent attorney or one with an MBA may go into administration or sales for an engineering firm.

Followup data are available from a variety of sources. However, few cover the whole Nation or are available on a recurring basis. State or area education and manpower agencies, individual schools, and private organizations such as the College Placement Council and the Bureau of Social Science Research are the largest publishers of followup study material.

A good example of a followup study is a survey conducted by the College Placement Council entitled *Career Plans of College Graduates of 1965 and 1970.* In this study, eight broad undergraduate majors were used: business, engineering, physical science, biological sciences, social sciences, humanities, education, and preprofessional, along with 17 broad occupational categories. Some significant findings as far as career choices were:

(1) business, teaching, the medical and law professions, and engineering were the most popular career choices of men graduates, accounting for over 50 percent; (2) teaching was the choice of almost 50 percent

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[25] For example: Robert Calvert, Jr., "Liberal Arts Graduates–What Do They Have to Report?" *Journal of College Placement* February-March 1969, and *Five Years After the College Degree,* 5 vol. (Bureau of Social Science Research, 1965-67).

of the women; (3) a large proportion of graduates with business, engineering, education, and preprofessional majors chose the single career occupation directly related to their field of study.

Another followup study[26] shows that people who obtain a Ph.D. do not always enter the occupational area for which they are trained. The next tabulation shows that 10 percent of all Ph.D. recipients accept employment in areas other than their specialty and that these entry rates vary by specialty.

Specialty	*Percent entering other fields*
All Ph.D. recipients	9.8
Arts and humanities	20.2
Educators	19.0
Agricultural scientists	15.7
Chemists	13.6
Social sciences	11.9
Psychologists	9.9
Engineers	8.5
Mathematicians	7.9
Bioscientists	7.5
Medical scientists	7.5
Physicists and astronomers	7.1
Earth scientists	3.6

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[26] *Summary Report 1971: Doctorate Recipients from U.S. Universities* (National Research Council, April 1972).

Chapter 4. Relating Training to Occupational Needs

This chapter presents information on ways workers qualify for jobs in each of 240 occupations. Each discussion of occupational training requirements is followed by statistics on 1972 employment, 1985 requirements, the projected rate of growth from 1972 to 1985, projected annual openings for growth and replacement, and the most recent data on the number of persons completing training. The data on training are for the following time periods:

- Junior college graduates – academic year 1970-71
- Federal manpower programs (MDTA, etc.) – fiscal year 1973
- Vocational education completions – fiscal year 1971
- Apprenticeship completions – calendar year 1972
- College graduates – academic year 1970-71 and projected 1972-85 annual average

A dash means that no statistics on training are available.

These statistics on occupational requirements and training are also presented in tabular form in appendixes C and D.

The detailed information on occupations is preceded by a discussion of the overall outlook for college graduates for the 1972-85 period and some of the major implications of this outlook. For specific occupations that require at least a bachelor's degree, a brief supply-demand analysis is presented when possible. For other occupations an analysis of this type is presented if data are complete or if such an analysis is meaningful. Supply-demand analyses are not presented for occupations such as waiters and waitresses. For this kind of occupation, training is generally given on the job and entry to the occupation is relatively easy. Nevertheless, statistics on annual job openings are valuable to develop special programs for occupations that require little formal training.

The Outlook for College Graduates

In the past two decades, the rise in the educational level of the labor force was paralleled by rising educational requirements of jobs. This was reflected in a more rapid growth of the major occupational groups with the highest educational attainment. The major apparent gaps were a shortfall of college graduates trained to work in engineering, scientific, teaching, and medical professions from the late 1950's to the mid-1960's. Looking to the future, the question arises as to whether the increasing educational attainment of the population will continue to match the increase in the number of jobs offering satisfactory employment for those with higher educational qualifications. An analysis of existing trends in the supply of and demand for college graduates may throw some light on the question.

U.S. colleges and universities–principal suppliers of the country's most highly trained manpower–are projected by the U.S. Office of Education to continue turning out record numbers of graduates through the mid-1980's. Twice as many college degrees will be earned from 1972 through 1985 as were earned during the preceding 13 years from 1959 through 1972. The Office of Education has projected that a total of 20.1 million degrees will be awarded over the 1972-85 period:[27]

Degree	*Degrees awarded (millions)*	*Percent increase 1972-85*
Total	20.1	46
Bachelor's	14.6	44
Master's	4.0	41
Doctor's	.6	66
First professional, including law, medicine, dentistry, etc.	.9	85

Not all degree recipients, however, can be considered part of the effective new supply of college-educated workers. Most master's and doctorate degree recipients are employed before receiving their advanced degrees and are already considered part of the existing supply of college-educated workers. Other degree recipients, especially at the bachelor's level, delay entry into the labor force to continue their education, enter the Armed Forces, or become full-time housewives.

Relying on past patterns of entry into the labor force,

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[27] These projections are based on a continuation of the pattern of enrollments in college by the college-age population. See *Projections of Educational Statistics to 1980-81*, OE 72-99, for additional details on the basic assumptions used by the Office of Education, U.S. Department of Health, Education, and Welfare in developing projections of earned degrees.

Table 9. Projected supply of college graduates, 1972-85

[In thousands]

Source	1972-85	1972-80	1980-85
Total	15,300	8,850	6,450
New college graduates	13,170	7,540	5,630
Bachelor's degree recipients	11,200	6,405	4,795
Master's degree recipients	1,200	700	500
Doctor's degree recipients	20	10	10
First professional degree recipients	750	425	325
Military separations	1,220	750	470
Other	910	560	350

it is estimated that 13.2 million persons will enter the civilian labor force between 1972 and 1985 upon receiving their degrees; 11.2 million at the bachelor's level, 1.2 million at the master's, approximately 20,000 at the doctorate level, and 750,000 recipients of first professional degrees. (See table 9.)

In addition, the supply of new graduates between 1972 and 1985 will be augmented by more than 2.1 million persons with college-level training who will not enter the labor force directly from college. These expected additions will consist of over 900,000 immigrants and delayed entrants and reentrants to the labor force—primarily women who delayed seeking a job or who were working in earlier years but who withdrew from the labor force—and more than 1.2 million perons entering the civilian labor force after separation from the military services. Thus, the new supply of college-educated manpower expected to enter the labor force from 1972 to 1985 will total 15.3 million.

Nearly one-quarter of all job openings between 1972 and 1985 are expected to require persons who have completed four years or more of college. In comparison, during the preceding 13 years between 1959 and 1972 about 18 percent of all job openings were filled by college graduates.

Job opportunities for college-educated workers stem from three sources: growth in employment in occupations currently requiring a college degree for entry; the need to replace workers in such occupations who die, retire, or leave the labor force for other reasons; and educational upgrading, the trend toward hiring college graduates for jobs once performed by workers with less education.

An analysis of growth, replacement, and rising entry requirements indicates that 14.5 million new college graduates will be needed between 1972 and 1985; 7.7 million to take care of occupational growth and rising entry requirements, and 6.8 million for replacements. (See table 10.) Thus, the available supply, 15.3 million, will be about 800,000 above projected job requirements. This prospective situation will affect workers across the entire occupational spectrum.

Table 10. Projected requirements for college graduates, 1972-85

[In thousands]

Type of requirement	1972-85	1972-80	1980-85
Total	14,500	8,800	5,700
Growth	7,700	5,000	2,700
Replacement	6,800	3,800	3,000

A greater oversupply of college graduates is expected over the 1980-85 period than over the 1972-80 period. The projected "gap" is roughly 100,000 for 1972-80, or 12,500 a year on the average, and 700,000 for 1980-85, or 140,000 a year. The widening of the gap arises from the expected slowdown in the rate of growth of the economy in the later period and not from an accelerated increase in the number of degree recipients. In fact, the rise in the number of degree recipients will slow over 1980-85. The average number of degrees granted annually over 1972-80 is expected to total about 1,441,000, almost 70 percent or 585,000 higher than the previous 10 years' average of 856,000 annually. (See table 11.) But over the 1980-85 period, degrees granted will average 1,718,000, only 277,000 more or 19 percent higher than over 1972-80. However, it is expected that job openings over 1980-85 will be rising at an even slower rate. Annual job openings will increase an average of only 4 percent, a rise of barely 50,000 over the average of 1.1 million job openings annually over the 1972-80 period.

The amount of educational upgrading is determined by a number of factors—some related to the changing nature or content of existing jobs and some related to noneconomic factors. College graduates will be demanded in some jobs traditionally held by less educated workers due to the increasingly complex skills required for those jobs.

Rising entry requirements may simply reflect the

Table 11. Average annual number of earned degrees, 1962-72 and projected for selected periods, 1972-85

Degree		Projected		
	1962-72	1972-85	1972-80	1980-85
Total	855,900	1,547,700	1,441,100	1,718,300
Bachelor's	633,000	1,122,400	1,043,500	1,248,600
Master's	166,500	304,200	285,700	333,800
Doctor's	22,800	48,600	44,700	55,000
First professional	33,600	72,400	67,200	80,900

NOTE: Detail may not add to totals because of rounding.

greater number of college graduates available for employment as well as a general tendency to hire the person who has the highest educational qualifications, especially for white-collar jobs. In the past, employers might have preferred to hire college graduates for various jobs but were not able to compete for them. If substantial numbers of college graduates were unsuccessful in finding a job in the career of their choice, they would be available to fill upgraded jobs.

Increased employment of college graduates outside of the professions may also reflect a lack of ability or motivation for professional work on the part of some graduates. It may also reflect sexual and racial discrimination as well as a host of other factors.

College graduates are expected to continue to have a competitive advantage over those with less education. Despite the projected surplus of college graduates for the 1980-85 period, it is unlikely that college graduates will experience significant levels of unemployment. Rather, they are likely to obtain jobs previously held by individuals with less than 4 years of college. In general, graduates have reacted to changes in the job situation in the past by taking the best available job and there is no reason to assume that this will change. Problems for college graduates will more likely be employment below the level of skill for which they were trained, resulting in job dissatisfaction and high occupational mobility rather than unemployment.

The apparent abundance of college graduates as a whole in the 1972-85 period does not imply that all supply-demand imbalances in the professions will be eliminated. Much depends on the number of students who prepare for each professional field. This will depend not only on the choices students make but also on the capacity of schools of medicine, engineering, and other fields where the number of students that can be accommodated is relatively inflexible over the short run.

It is difficult to predict the number of job opportunities in a given field in relation to the number of individuals who will choose careers in the field, but it is useful to trace what would happen if recent trends in the number of students who elect to study and enter each field continued through the mid-1980's. Based on past experience, it is likely that there will be wide variation among occupations in the relation between supply and demand. In the following section of this chapter a supply-demand analysis is presented for specific occupations where the data allow.

For specific occupations, prospective imbalances may be intensified unnecessarily if short-run job situations are allowed to outweigh the long-range employment outlook in making educational and career decisions. In engineering, for example, freshman enrollments dropped 11 percent between 1970 and 1971, according to data from the Engineers Joint Council. Yet, manpower requirements are expected to rise substantially in engineering over the 1970-80 decade as a whole, implying a repetition of the 1960's scarcity of personnel in the profession unless the downtrend in enrollments is quickly ended.

By contrast, indications are that the softened demand for Ph.D.'s which characterized the employment situation in the last few years may not improve as the decade progresses. Projections of the National Science Foundation suggest that the oversupply of Ph.D.'s in the sciences and engineering could range between 15,000 and 60,000 by 1980.[28] Other studies[29] have indicated that the country may produce more Ph.D.'s in all fields than will be required. As with college graduates in general, a greater number of Ph.D.'s than available jobs traditionally requiring the degree may mean underemployment or more job shifting. The result in either case is likely to be job dissatisfaction, however, rather than unemployment. However, this does not mean employment problems will not exist. There is some evidence that employers in private industry may not want to employ scientists and engineers with Ph.D.'s in jobs not requiring that level of education.[30] They may not want to hire workers who will be dissatisfied and leave their jobs or who require too high a salary compared to less highly trained workers who can perform the same job.

The availability of more college-trained workers is expected to have an adverse effect on many of the less educated. It is likely to mean that, in the future, workers with less than a college education will have less chance of advancing to professional positions, as many could do in the past, particularly in professions such as engineering and accounting. They may also have less opportunity for promotion to higher level positions in sales, managerial, and some clerical and service occupations. This is essentially a problem of credentials.

College graduates, however, will not be in a more favorable position in all occupations. In the crafts, workers in greatest demand will be those who have vocational training rather than a college education; as in the past, persons with college degrees will make little inroads in the crafts. Similarly, employers seeking operatives and laborers will be reluctant to hire college graduates except for some part-time or temporary jobs because of the obvious potential for job dissatisfaction. Moreover, in another broad occupational area closely related to professional work—paraprofessional and technical work—college graduates are likely to face stiffer competition. Community and junior colleges and other post secondary schools have proven they can train workers for many occupations in this category through 2-year programs or less, and the number of students completing these career educational programs is expected to increase even more rapidly than the number of college graduates.

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[28] *1969 and 1980 Science and Engineering Doctorate Supply and Utilization*, NSF 71-20 (Washington, National Science Foundation, 1971).

[29] See, for example, Deal Wolfle and Charles V. Kidd, "The Future Market for Ph.D.'s," *Science*, August 17, 1971, pp. 784-93, and Allan M. Cartter, "Scientific Manpower for 1970-85," *Science*, April 9, 1971, pp. 132-40.

[30] *Ph.D. Scientists and Engineers in Private Industry, 1968-80*, Bulletin 1648 (Bureau of Labor Statistics, 1970).

Another condition which may arise is that young people in high school will become aware of the plight of new college graduates who are not able to enter the field of their choice and therefore change their aspirations for a college education. Because current society esteems a college degree and recognizes the benefits of a college education for aspects of life other than work, such changed aspirations are not anticipated in great numbers. The complexity of the problem suggests the need for growing emphasis on vocational guidance to provide young people with the background needed to make a satisfactory choice for education and career.

Industrial Production and Related Occupations

Foundry occupations

Patternmakers. A 5-year apprenticeship is the best way to learn the patternmaking trade. Trade school courses in patternmaking may be credited toward completion of the apprenticeship. A high school education is generally required.

Employment, 1972	19,000
Projected 1985 requirements	19,300
Percent growth, 1972-85	1.5
Average annual openings, 1972-85	450
Growth	25
Replacements	425

Available training data:

Apprenticeship completions	275

Molders. Hand molders usually learn their trade through a 4-year apprentice program. Some less skilled hand molders acquire skills on the job. Apprenticeship training is also preferred for some kinds of machine molding. An eighth grade education is required for apprentices, but many employers require additional education.

Employment, 1972	56,000
Projected 1985 requirements	57,000
Percent growth, 1972-85	1.5
Average annual openings, 1972-85	1,100
Growth	100
Replacements	1,000
Available training data	–

Coremakers. A 4-year apprenticeship is the recommended training for coremakers. Apprentices must have at least an eighth grade education, but some employers require graduation from high school. For less skilled coremaking jobs, inexperienced workers may be hired and trained on the job or other foundry workers may be upgraded.

Employment, 1972	23,000
Projected 1985 requirements	23,300
Percent growth, 1972-85	1.5
Average annual openings, 1972-85	475
Growth	25
Replacements	450

Available training data:

MDTA:

OJT enrollments	1

Machining occupations

All-round machinists. A 4-year apprenticeship program is the usual way to learn the trade, but some companies have training programs for single-purpose machinists that require less than 4 years. Many machinists, however, learn on the job. A typical 4-year apprenticeship includes 8,000 hours of shop training and 570 hours of classroom training. A high school or vocational school education that includes courses in mathematics, physics, and machine shop is desirable.

Employment, 1972	320,000
Projected 1985 requirements	400,000
Percent growth, 1972-85	24.8
Average annual openings, 1972-85	13,100
Growth	6,100
Replacements	7,000

Available training data:

MDTA:

OJT enrollments	215
Institutional completions	78
Apprenticeship completions	3,695

Instrument makers (mechanical). Most instrument makers learn their trade through apprenticeships. Others advance from the ranks of machinists or skilled machine tool operators. A typical 4-year apprenticeship consists of about 8,000 hours of shop training and 576 hours of classroom instruction.

Employers generally prefer that apprentices have a high school education, including courses in algebra, geometry, science, and machine shop work.

Employment, 1972	5,000
Projected 1985 requirements	6,000
Percent growth, 1972-85	20.0
Average annual openings, 1972-85	200
Growth	100
Replacements	100

Available training data:

MDTA:

OJT enrollments	20

Machine tool operators. Most semiskilled operators learn their trade on the job in a few months, but to become a skilled operator often requires 1½ to 2 years of experience. Although there are no special educational requirements, courses in mathematics and blueprint reading are helpful.

Employment, 1972	546,000
Projected 1985 requirements	670,000
Percent growth, 1972-85	22.9
Average annual openings, 1972-85	25,600
Growth	9,600
Replacements	16,000

Available training data:

MDTA:

OJT enrollments	840
Institutional completions	1,833
Job Corps completions	137

Setup men (machine tools). Setup men usually must qualify as all-round machinists. They must have thorough training in the operation of one or more kinds of machine tools and be able to select the sequence of operations so that metal parts will be made according to specifications.

Employment, 1972	43,000
Projected 1985 requirements	59,000
Percent growth, 1972-85	37.2
Average annual openings, 1972-85	2,200
Growth	1,200
Replacements	1,000

Available training data:

MDTA:

OJT enrollments	400
Institutional completions	143

Tool and die makers. Skills can be acquired through formal 4-or 5-year apprenticeships or on the job. Most employers prefer apprentices who have a high school or trade school education. Many metal machine workers, after years of experience, take classroom training to become tool and die makers.

Employment, 1972	172,000
Projected 1985 requirements	183,000
Percent growth, 1972-85	6.4
Average annual openings, 1972-85	4,200
Growth	800
Replacements	3,400

Available training data:

MDTA:

OJT enrollments	94
Institutional completions	183
Apprenticeship completions	3,825

Printing (graphic arts) occupations

Bookbinders and related workers. A 4- or 5-year apprenticeship that combines on-the-job training with related classroom instruction generally is required to qualify as a skilled bookbinder. Apprenticeship applicants usually must have a high school education.

The less skilled bindery workers learn the trade through informal on-the-job training that may last from several months to 2 years.

Employment, 1972	32,000
Projected 1985 requirements	38,000
Percent growth, 1972-85	17.3
Average annual openings, 1972-85	550
Growth	450
Replacements	100

Available training data:

Job Corps completions	27
Apprenticeship completions	231

Composing room occupations. Most compositors learn their trade through apprenticeships that generally require 6 years of progressively advanced training supplemented by classroom instruction or correspondence courses. Some learn on the job by working as helpers for several years; others combine trade school and helper experience. Applicants for apprenticeships usually must be high school graduates.

Employment, 1972	170,000
Projected 1985 requirements	166,000
Percent growth, 1972-85	−2.3
Average annual openings, 1972-85	4,300
Growth	−300
Replacements	4,600

Available training data:

MDTA:

OJT enrollments	34
Apprenticeship completions	844

Electrotypers and stereotypers. These workers usually learn their trades through 5-to-6 year apprenticeships that include training on the job and classes in related technical subjects. Apprenticeship applicants usually must have a high school education.

Employment, 1972	7,000
Projected 1985 requirements	6,000
Percent growth, 1972-85	−14.8
Average annual openings, 1972-85	100
Growth	−100
Replacements	200

Available training data	—

Lithographic occupations. A 4- or 5-year apprenticeship usually is required to become a well-rounded lithographic craftsman. Apprenticeship programs may emphasize a specific craft, such as platemaker or pressman, although an attempt is made to make the apprentice familiar with all lithographic operations. Apprenticeship applicants generally must be high school graduates.

Employment, 1972	81,000
Projected 1985 requirements	120,000
Percent growth, 1972-85	48.4
Average annual openings, 1972-85	5,100
Growth	3,000
Replacements	2,100

Available training data:

MDTA:

Institutional completions	54
Apprenticeship completions	518

Photoengravers. Most photoengravers learn their skills through a 5-year apprenticeship that includes at least 800 hours of classroom instruction. Apprenticeship applicants usually must have a high school education, preferably with courses in chemistry and physics.

Employment, 1972	16,000
Projected 1985 requirements	15,000
Percent growth, 1972-85	−9.2
Average annual openings, 1972-85	200
Growth	−100
Replacements	300

Available training data:

MDTA:

Institutional completions	30

Printing pressmen and assistants. The most common way of learning the pressman's trade is through apprenticeship that combines on-the-job training and related classroom or correspondence school work. The apprenticeship period in commercial printing shops is 2 years for press assistants and 4 to 5 years for pressmen. Some workers learn their skills on the job by working as helpers or press assistants or through a combination of work experience and training in vocational or technical schools. High school education generally is required; courses in physics and chemistry are recommended.

Employment, 1972	142,000*
Projected 1985 requirements	183,000
Percent growth, 1972-85	28.6
Average annual openings, 1972-85	6,100
Growth	3,200
Replacements	2,900

Available training data:

MDTA:

OJT enrollments	9
Institutional completions	14
Job Corps completions	204
Apprenticeship completions	635

Other industrial production and related occupations

Assemblers. Training varies according to the level of skill required. Most inexperienced people can be trained in a few days or weeks, but some training lasts much longer. Although a high school diploma is usually not required, many employers prefer high school graduates or workers who have vocational school courses such as blueprint reading, especially for the more highly skilled jobs.

Employment, 1972	1,017,000
Projected 1985 requirements	1,100,000
Percent growth, 1972-85	7.2
Average annual openings, 1972-85	40,500
Growth	5,500
Replacements	35,000

Available training data:

MDTA:

OJT enrollments	396
Institutional completions	150
Job Corps	986

Automobile painters. Most automobile painters start as helpers and acquire their skills informally by working for 3 to 4 years with experienced painters. A small number learn through a 3-year apprenticeship. Applicants who have a high school education are preferred.

Employment, 1972	25,000

Projected 1985 requirements	29,000
Percent growth, 1972-85	16.1
Average annual openings, 1972-85	800
Growth	300
Replacements	500

Available training data:

MDTA:

OJT enrollments	1
Institutional completions	30

Blacksmiths. Most beginners train on the job as helpers in blacksmith shops. Others enter through formal apprenticeship programs which generally last 3 or 4 years.

Employment, 1972	10,000
Projected 1985 requirements	9,400
Percent growth, 1972-85	-6.4
Average annual openings, 1972-85	350
Growth	-50
Replacements	400
Available training data	–

Boilermaking occupations. Many boilermakers acquire skills on the job, but most training authorities agree that a 4-year apprenticeship is the best way to learn this trade. Layout men and fitup men generally learn their trades on the job by working as helpers for 2 or more years. Employers prefer high school graduates.

Employment, 1972	33,000
Projected 1985 requirements	39,000
Percent growth, 1972-85	18.6
Average annual openings, 1972-85	1,300
Growth	500
Replacements	800

Available training data:

MDTA:

OJT enrollments	58
Apprenticeship completions	504

Electroplaters. Most electroplaters learn the trade on the job. A small percentage of electroplaters train through a 3- or 4-year apprenticeship program and a few take a 1- or 2-year electroplating course in a junior college, technical institute, or vocational high school.

Employment, 1972	17,000
Projected 1985 requirements	21,000
Percent growth, 1972-85	24.0
Average annual openings, 1972-85	900
Growth	300
Replacements	600
Available training data	–

Foremen. Most workers who are promoted to foreman jobs are high school graduates who have learned their skills on the job. Although fewer than one-tenth of all foremen are college graduates, a growing number of employers are hiring foreman trainees with college backgrounds.

Employment, 1972	1,400,000
Projected 1985 requirements	1,700,000
Percent growth, 1972-85	21.6
Average annual openings, 1972-85	58,000
Growth	24,000
Replacements	34,000

Available training data:

Vocational education completions:

Secondary	434
Postsecondary	1,176

Forge shop occupations. Most workers learn their trades on the job. Some forge shops offer apprentice training programs for skilled jobs, such as die sinker and heat treater. High school graduates are preferred, especially for the more skilled jobs.

Employment, 1972	63,000
Projected 1985 requirements	66,000
Percent growth, 1972-85	4.1
Average annual openings, 1972-85	1,300
Growth	200
Replacements	1,100
Available training data	–

Furniture upholsterers. The most common way to learn this trade is to complete on-the-job training in an upholstery shop. Other ways of acquiring training are by working for furniture manufacturers in jobs closely related to upholstering, or through vocational or high school courses. A few people acquire the necessary skills through formal apprenticeship programs that last from 3 to 4 years.

Employment, 1972	35,000
Projected 1985 requirements	39,000
Percent growth, 1972-85	12.6
Average annual openings, 1972-85	1,400
Growth	300
Replacements	1,100

Available training data:

MDTA:

OJT enrollments	15
Institutional completions	144
Job Corps completions	142

Vocational education completions:

Secondary	2,481
Postsecondary	256

Inspectors. Inspectors are generally trained on the job. Training may last from a few hours to several months depending on the skill level. Requirements for the job vary. Some employers hire applicants who do not have a high school diploma but who have qualifying aptitudes or related experience. Other employers prefer experienced production workers.

Employment, 1972	725,000
Projected 1985 requirements	940,000
Percent growth, 1972-85	29.7
Average annual openings, 1972-85	44,700
Growth	16,600
Replacements	28,100

Available training data:

Vocational education completions:	
Secondary	401
Postsecondary	264

Millwrights. These workers generally acquire their skills on the job or through 4-year apprenticeship programs that combine shop training with classroom instruction. Many companies require that apprentice applicants be high school graduates.

High school courses in science, mathematics, mechanical drawing, and machine shop are useful to the prospective millwright.

Employment, 1972	83,000
Projected 1985 requirements	103,000
Percent growth, 1972-85	24.3
Average annual openings, 1972-85	3,300
Growth	1,600
Replacements	1,700

Available training data:

MDTA:	
OJT enrollments	58
Institutional completions	8
Apprenticeship completions	1,080

Motion picture projectionists. Most motion picture theaters in urban areas are unionized and young people who aspire to work as projectionists in these theaters must complete a union apprenticeship program. In a nonunion theater, a trainee may start as an usher or helper and learn the trade by working with an experienced projectionist. A high school education is preferred by employers.

Employment, 1972	16,000
Projected 1985 requirements	19,000
Percent growth, 1972-85	15.3
Average annual openings, 1972-85	1,000
Growth	200
Replacements	800
Available training data	–

Photographic laboratory workers. Most darkroom technicians learn their trade by 3 to 4 years of on-the-job training; some helpers become specialists in a particular activity, which usually requires less training time. A high school education is preferred and college courses are helpful for those interested in supervisory or managerial jobs. On-the-job training for workers in semiskilled photographic laboratory occupations may range from a few weeks to several months.

Employment, 1972	38,000
Projected 1985 requirements	52,000
Percent growth, 1972-85	36.4
Average annual openings, 1972-85	2,700
Growth	1,000
Replacements	1,700

Available training data:

MDTA:	
Institutional completions	14
Vocational education completions:	
Secondary	1,370
Postsecondary	1,216
Junior college graduates	577

Power truck operators. Most workers can be trained on the job to operate a power truck in a few days. It may take several weeks, however, to learn the physical layout and operation of a plant and the most efficient way of handling the materials to be moved.

Employment, 1972	300,000
Projected 1985 requirements	370,000
Percent growth, 1972-85	22.2
Average annual openings, 1972-85	9,100
Growth	5,100
Replacements	4,000

Available training data:

Job Corps completions	19

Production painters. New workers usually learn the job by watching and helping experienced workers. Training may vary from a few days to several months. A high school diploma is generally not required.

Employment, 1972	180,000
Projected 1985 requirements	197,000
Percent growth, 1972-85	9.4
Average annual openings, 1972-85	5,000
Growth	1,300
Replacements	3,700

Available training data:

MDTA:	
OJT enrollments	5

Stationary engineers. Many stationary engineers start as helpers or craftsmen in other trades and acquire their skills informally on the job. Most training authorities, however, recommend a 3- to 4-year apprenticeship as the best way to learn this trade. High school or trade school graduates with courses in mathematics, mechanical drawing, machine shop practices, physics, and chemistry are preferred. Some States and cities require stationary engineers to be licensed.

Employment, 1972	178,000
Projected 1985 requirements	178,000
Percent growth, 1972-85	0.0
Average annual openings, 1972-85	4,600
Growth	0
Replacements	4,600

Available training data:

MDTA:

OJT enrollments	22

Stationary firemen. Most learn their skills by working as helpers in boiler rooms. Some large cities and a few States require stationary firemen to be licensed.

Employment, 1972	93,000
Projected 1985 requirements	88,000
Percent growth, 1972-85	−5.0
Average annual openings, 1972-85	2,100
Growth	−400
Replacements	2,500

Available training data:

Vocational education completions:

Secondary	70
Postsecondary	55

Waste water treatment plant operators (sewage plant operators). Trainees usually start as helpers and learn their skills on the job. Some States require, and employers generally prefer, high school graduates. Some positions, especially in larger cities and towns, are covered by civil service regulations and applicants may be required to pass examinations on elementary mathematics, mechanical aptitude, and general intelligence. A 2-year program leading to an associate degree in wastewater technology is an excellent way to bypass much of the on-the-job training and advance more rapidly.

Employment, 1972	20,000
Projected 1985 requirements	31,000
Percent growth, 1972-85	54.0
Average annual openings, 1972-85	1,200
Growth	800
Replacements	400

Available training data:

MDTA:

OJT enrollments	509
Institutional completions	37

Vocational education completions:

Postsecondary	234

Welders and flame cutters. Generally, it takes several years of training to become a skilled manual arc or gas welder, and somewhat longer to become a combination welder. Some of the less skilled jobs, however, can be learned after a few months of on-the-job training. Flamecutters usually can learn their work in a few weeks. For entry to manual welding jobs, most employers prefer applicants who have high school or vocational school training in welding methods. Before being assigned to work where the strength of the weld is a highly critical factor, welders may be required to pass a qualifying examination.

Employment, 1972	554,000
Projected 1985 requirements	770,000
Percent growth, 1972-85	39.0
Average annual openings, 1972-85	27,200
Growth	16,700
Replacements	10,500

Available training data:

MDTA:

OJT enrollments	349
Institutional completions	6,442
Job Corps completions	1,916

Office Occupations

Clerical occupations

Bookkeeping workers. For bookkeeping jobs, most employers prefer high school graduates who have taken business arithmetic and bookkeeping courses. Some prefer applicants who have completed business courses at a junior college or business school. The ability to type and operate various office machines also is preferred.

Employment, 1972	1,584,000
Projected 1985 requirements	1,900,000

Percent growth, 1972-85	19.5
Average annual openings, 1972-85	118,000
Growth	24,000
Replacements	94,000

Available training data:

MDTA:

OJT enrollments	160
Institutional completions	63
Job Corps completions	24

Cashiers. For cashier jobs employers prefer people who have completed high school. Courses in business arithmetic, bookkeeping, typing, and other business subjects are good preparation.

Employment, 1972	998,000
Projected 1985 requirements	1,360,000
Percent growth, 1972-85	36.1
Average annual openings, 1972-85	96,000
Growth	28,000
Replacements	68,000

Available training data:

MDTA:

OJT enrollments	37
Institutional completions	97
Job Corps completions	113

File clerks. Employers prefer high school graduates for beginning file clerk jobs. Many seek applicants who can type and have some knowledge of office practices.

Employment, 1972	272,000
Projected 1985 requirements	318,000
Percent growth, 1972-85	16.7
Average annual openings, 1972-85	22,800
Growth	3,500
Replacements	19,300

Available training data:

MDTA:

OJT enrollments	37
Institutional completions	820
Job Corps completions	277

Hotel front office clerks. Although education beyond high school generally is not required for these jobs, hotel employers are attaching greater importance to college training in selecting applicants who may later advance to managerial positions.

Employment, 1972	49,000
Projected 1985 requirements	69,000
Percent growth, 1972-85	41.2
Average annual openings, 1972-85	4,800
Growth	1,600
Replacements	3,200

Available training data:

MDTA:

OJT enrollments	8

Office machine operators. Graduation from high school or business school is the usual requirement for office machine operator jobs. Courses in typing and business arithmetic are helpful. The amount of on-the-job training required varies by type of machine used.

Employment, 1972	195,000
Projected 1985 requirements	230,000
Percent growth, 1972-85	17.9
Average annual openings, 1972-85	13,700
Growth	2,700
Replacements	11,000

Available training data:

MDTA:

OJT enrollments	15
Institutional completions	109
Job Corps completions	565

Postal clerks. These workers must be at least 18 and pass an examination that tests reading accuracy, the ability to follow oral instructions, vocabulary, and simple arithmetic. Applicants must also pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds.

Employment, 1972	286,000
Projected 1985 requirements	312,000
Percent growth, 1972-85	8.8
Average annual openings, 1972-85	10,500
Growth	1,900
Replacements	8,600
Available training data	—

Receptionists. Formal educational requirements rarely are specified beyond a high school diploma. Nevertheless, many receptionists have some college training. Business courses, such as elementary bookkeeping and business practices, are valuable for applicants seeking beginning positions.

Employment, 1972	436,000
Projected 1985 requirements	650,000
Percent growth, 1972-85	50.0
Average annual openings, 1972-85	55,100
Growth	16,800
Replacements	38,300

Available training data:

MDTA:

OJT enrollments	19
Job Corps completions	37

Shipping and receiving clerks. High school graduates are preferred for beginning jobs in shipping and receiving departments. Business arithmetic, typing, and other high school business subjects are helpful, as is the ability to write legibly. Post-high school training is important for advancement to warehouse manager or other responsible jobs.

Employment, 1972	451,000
Projected 1985 requirements	490,000
Percent growth, 1972-85	9.1
Average annual openings, 1972-85	13,800
Growth	3,200
Replacements	10,600

Available training data:

MDTA:

OJT enrollments	23

Statistical clerks. Most employers prefer statistical clerks who are high school graduates. Those who have had courses in business arithmetic, bookkeeping, and typing are considered well prepared for this type of work.

Employment, 1972	299,000
Projected 1985 requirements	375,000
Percent growth, 1972-85	25.8
Average annual openings, 1972-85	23,000
Growth	6,000
Replacements	17,000
Available training data	–

Stock clerks. Although there are no specific educational requirements for stock clerks, employers prefer high school graduates. Many look for reading and writing skills, a basic knowledge of mathematics, and typing and filing abilities. Some stock clerks must meet bonding standards.

Employment, 1972	511,000
Projected 1985 requirements	750,000
Percent growth, 1972-85	46.2
Average annual openings, 1972-85	34,800
Growth	18,200
Replacements	16,600

Available training data:

MDTA:

OJT enrollments	52
Institutional completions	2,076
Job Corps completions	210

Stenographers and secretaries. Graduation from high school is essential for practically all secretarial and stenographic positions. Many employers prefer applicants who have additional training at a college or private business school. Generally employers have minimum standards of typing and stenographic speed and accuracy that must be met before an employee is hired.

Employment, 1972	3,074,000
Projected 1985 requirements	4,950,000
Percent growth, 1972-85	60.8
Average annual openings, 1972-85	411,000
Growth	144,000
Replacements	286,000

Available training data:

MDTA:

OJT enrollments	305
Institutional completions	1,720
Job Corps completions	146

Vocational education completions:

Secondary	107,368
Postsecondary	24,328
Bachelor's degrees in secretarial studies	1,323
Junior college graduates in secretarial technologies	16,534

Typists. Most employers require applicants to have a high school diploma and to meet certain standards of typing speed and accuracy. Good spelling, punctuation, and grammar are essential. Most typists learn their skills by attending day or evening classes in public or private schools.

Employment, 1972	1,021,000
Projected 1985 requirements	1,400,000
Percent growth, 1972-85	38.7
Average annual openings, 1972-85	115,700
Growth	30,400
Replacements	85,300

Available training data:

MDTA:

OJT enrollments	151
Institutional completions	1,252
Job Corps completions	1,258

Vocational education completions:

Secondary	105,098
Postsecondary	8,899

Computer and related occupations

Electronic computer operating personnel. In filling these jobs, employers usually require at least a high school education. For console operator positions, some college training may be preferred.

Employment, 1972	480,000
Projected 1985 requirements	531,000
Percent growth, 1972-85	10.6
Average annual openings, 1972-85	27,000
Growth	4,000
Replacements	23,000

Available training data:

MDTA:

Institutional completions	6,165
Junior college graduates	158

Programmers. Those programmers hired for scientific, engineering, or related work usually must have a bachelor's degree with a major in the physical sciences, mathematics, engineering, or computer science. Some jobs require a graduate degree. For business programming, experience often is more important than a college degree, although college courses in data processing, accounting, and business administration are helpful. Data presented below represent degrees earned in programming. Also qualified for programming jobs are many persons with college training in data processing and computer and information sciences.

Employment, 1972	186,000
Projected 1985 requirements	290,000
Percent growth, 1972-85	55.9
Average annual openings, 1972-85	13,000
Growth	8,000
Replacements	5,000

Available training data:

Bachelor's degrees	32
Master's degrees	5
Junior college graduates	2,149

MDTA:

Institutional completions	3

Systems analysts. Although there is no single acceptable way of preparing for work as a systems analyst, most employers prefer applicants who have college training and experience in computer programming. Many employers seek candidates who have a bachelor's degree in mathematics, science, engineering, or business; others stress a graduate degree. Systems analyst trainees can learn to use data processing equipment on the job or through special courses offered by colleges and computer manufacturers. Data presented below represent degrees earned in systems analysis. Also qualified for systems analysis jobs are many persons with college training in data processing, programming, and computer and information sciences.

Employment, 1972	103,000
Projected 1985 requirements	185,000
Percent growth, 1972-85	79.6
Average annual openings, 1972-85	8,300
Growth	6,300
Replacements	2,000

Available training data:

Bachelor's degrees	88
Master's degrees	88
Ph.D.'s	6

Banking occupations

Bank clerks. High school graduation is adequate preparation for beginning clerical jobs in banks. For most jobs, courses in bookkeeping, typing, business arithmetic, and office machine operation are desirable.

Employment, 1972	473,000
Projected 1985 requirements	665,000
Percent growth, 1972-85	40.4
Average annual openings, 1972-85	43,200
Growth	14,700
Replacements	28,500

Available training data:

Job Corps completions	5

Bank officers. These positions may be filled by management trainees or by promoting experienced clerical workers. A business administration major in finance or a liberal arts curriculum including accounting, economics, commercial law, and statistics is excellent preparation for trainee positions.

Employment, 1972	219,000
Projected 1985 requirements	308,000
Percent growth, 1972-85	40.4
Average annual openings, 1972-85	13,600
Growth	6,800
Replacements	6,800

Available training data:

Degrees in banking and finance:

Bachelor's degrees	5,992
Master's degrees	1,781
Ph.D.'s	23

Tellers. Banks prefer high school graduates with experience in related clerical work when filling teller positions. Applicants also must meet bonding standards.

Employment, 1972	248,000
Projected 1985 requirements	350,000
Percent growth, 1972-85	40.4
Average annual openings, 1972-85	25,000
Growth	7,700
Replacements	17,300

Available training data:

MDTA:

OJT enrollments	13
Institutional completions	15

Insurance occupations

Actuaries. New entrants need a bachelor's degree with a major in mathematics, statistics, economics, or business administration and a thorough foundation in calculus, probability, and statistics to become an actuary. After entering a beginning actuarial position, they are required to pass a series of examinations which usually take between 5 and 10 years.

Employment, 1972	5,500
Projected 1985 requirements	9,000
Percent growth, 1972-85	62.0
Average annual openings, 1972-85	500
Growth	300
Replacements	200

Available training data:

See Statisticians p. 57, for combined data.

Claims adjusters. A college degree is increasingly required for beginning jobs as claim adjusters. For college graduates, no specific field of study is recommended. Many companies will hire those without college training, particularly if they have specialized experience. For example, a person experienced in automobile repair may qualify as an auto adjuster. A person with a business or accounting background may specialize in losses from business interruption or damage to merchandise. Those with college training in engineering or law will find their education helpful in adjusting bodily injury claims.

Most States require adjusters to be licensed. Applicants usually must complete an approved course in insurance or pass a written examination, be at least 20 years of age, and file a surety bond. Completion of independent study courses usually is very helpful in advancement to upper level jobs.

Employment, 1972	128,000
Projected 1985 requirements	152,000
Percent growth, 1972-85	19.0
Average annual openings, 1972-85	5,800
Growth	1,900
Replacements	3,900

Available training data	–

Claim examiners. College graduates are preferred for beginning claim examiner jobs. Although courses in insurance, economics, or other business subjects are helpful, a major in almost any college field is adequate preparation. Some firms hire high school graduates if they have related clerical experience or some college work. All beginners receive on-the-job training under the direction of an experienced claim manager.

Employment, 1972	31,000
Projected 1985 requirements	28,500
Percent growth, 1972-85	–7.8
Average annual openings, 1972-85	600
Growth	–200
Replacements	800
Available training data	–

Underwriters. Most insurance companies prefer college graduates for beginning underwriting jobs. Applicants with degrees in business administration or liberal arts are preferred, but a major in almost any field provides an adequate educational background. In some companies, experienced underwriting clerks may be trained as underwriters. Completion of independent study courses often is required for advancement to senior underwriting positions.

Employment, 1972	61,000
Projected 1985 requirements	71,000
Percent growth, 1972-85	16.6
Average annual openings, 1972-85	2,500
Growth	800
Replacements	1,700
Available training data	–

Administrative and related occupations

Accountants. Although junior college, business school, or correspondence course training is acceptable for some accounting jobs, most large public accounting and business firms require the bachelor's degree with a major in accounting or a related field and sometimes a master's degree in accounting. All States require "certified public accountants" to be certified by the State board of accountancy. In nearly all States at least 2 years of public accounting experience is necessary before CPA certification can be issued. About half of the States do not require CPA candidates to be college graduates.

Employment, 1972	714,000
Projected 1985 requirements	935,000
Percent growth, 1972-85	31.0
Average annual openings, 1972-85	41,900
Growth	17,000
Replacements	24,900

Available training data:

Junior college graduates	5,301
Bachelor's degrees	22,099
Master's degrees	1,097
Ph.D.'s	61

City managers. A bachelor's degree, preferably with a major in political science or public administration, is the minimum educational background needed to become a city manager. A master's degree in public or municipal administration is preferred.

Employment, 1972	2,500
Projected 1985 requirements	3,700
Percent growth, 1972-85	54.0
Average annual openings, 1972-85	150
Growth	100
Replacements	50
Available training data	–

Credit officials. A college degree is becoming increasingly important for beginning jobs as credit officials. Many employers seek persons who have majored in business administration, economics, or accounting, while others may hire graduates holding liberal arts degrees. Some employers promote high school graduates to credit official positions if they have experience in credit collection or in processing credit information.

Employment, 1972	114,000
Projected 1985 requirements	160,000
Percent growth, 1972-85	40.9
Average annual openings, 1972-85	7,500
Growth	3,600
Replacements	3,900
Available training data	–

Hotel managers and assistants. Although experience generally is the most important consideration in selecting managers, employers are increasingly emphasizing a college education. Many prefer applicants who have completed a 4-year college curriculum in hotel and restaurant administration. Some large hotel organizations have special management trainee programs for both college graduates and persons promoted from within.

Employment, 1972	110,000
Projected 1985 requirements	160,000
Percent growth, 1972-85	41.2
Average annual openings, 1972-85	7,500
Growth	3,600
Replacements	3,900

Available training data:

Junior college graduates	916
Bachelor's degrees in hotel and restaurant management	616
Master's degrees in hotel and restaurant management	18

Lawyers. Admission to the bar is a prerequisite for the practice of law in all States. To qualify for the bar examination, most States require 4 years of college followed by 3 years of law school. Four years of part-time study usually is required to complete a night school curriculum.

Based on past relationships between law school graduates, numbers taking and passing bar examinations, and numbers actually entering the occupation, an average of 18,695 law school graduates would be needed annually over the 1972-85 period to meet projected requirements of 16,500.

The number who received bachelor's or first professional degrees in 1972 was somewhat higher than projected annual needs over the 1972-85 period. If this trend in the number of graduates continues, those seeking to enter the legal profession will outnumber the available jobs.

Employment, 1972	303,000
Projected 1985 requirements	380,000
Percent growth, 1972-85	25.8
Average annual openings, 1972-85	16,500
Growth	6,000
Replacements	10,500

Available training data:

Bachelor's degrees	545
First professional degrees	17,421
Master's degrees	955
Doctor's degrees	20

Service Occupations

Cleaning and related occupations

Building custodians. There are no formal educational requirements for most custodial jobs and custodians usually acquire their skills on the job. However, entry workers should be able to do simple arithmetic and follow written instructions. High school courses may help the worker perform the many handyman tasks that are required.

Employment, 1972	1,885,000
Projected 1985 requirements	2,430,000
Percent growth, 1972-85	29.0
Average annual openings, 1972-85	136,000
Growth	42,000
Replacements	94,000

Available training data:

MDTA:

OJT enrollments	208
Institutional completions	500
Job Corps completions	1,089

Vocational education:

Secondary	1,951
Postsecondary	522

Exterminators. Most exterminators can do routine work after 2 or 3 months of on-the-job training. About 30 States require licenses. In most States, the license is only for registration, but a growing number of these States require applicants to pass a written examination. High school graduates are preferred.

Employment, 1972	25,000
Projected 1985 requirements	34,000
Percent growth, 1972-85	38.1
Average annual openings, 1972-85	1,300
Growth	800
Replacements	500

Available training data:

MDTA:

OJT enrollments	7
Institutional completions	1

Hotel housekeepers and assistants. Although no specific educational requirements exist for housekeepers, most employers prefer applicants who have at least a high school diploma.

Employment, 1972	17,000
Projected 1985 requirements	24,000
Percent growth, 1972-85	41.2
Average annual openings, 1972-85	1,700
Growth	600
Replacements	1,100

Available training data:

Vocational education completions:

Secondary	1,819
Postsecondary	211

Food service occupations

Bartenders. Most bartenders learn their trade on the job. Experience as a barboy, busboy, busgirl, waiter, or waitress is good training. Some private schools offer short courses in bartending.

Employment, 1972	200,000
Projected 1985 requirements	235,000
Percent growth, 1972-85	16.8
Average annual openings, 1972-85	8,800
Growth	2,600
Replacements	6,200

Available training data	–

Cooks and chefs. Most cooks—particularly those who work in small eating places—acquire their skills on the job. Less frequently, they are trained as apprentices under trade union contracts or employee training programs conducted by large hotels and restaurants. Training offered by a number of schools and other institutions is an advantage for applicants seeking jobs as cooks or chefs in large restaurants and hotels.

Employment, 1972	866,000
Projected 1985 requirements	1,000,000
Percent growth, 1972-85	14.2
Average annual openings, 1972-85	52,000
Growth	10,000
Replacements	42,000

Available training data:

MDTA:

OJT enrollments	101
Institutional completions	1,604
Job Corps completions	2,126
Apprenticeship completions	229

Meatcutters. These workers acquire their skills either informally on the job or through apprenticeship programs. Those in apprenticeship programs generally complete 2 to 3 years of supervised on-the-job training which may be supplemented by some classroom work. Employers generally prefer high school graduates.

Employment, 1972	200,000
Projected 1985 requirements	198,000
Percent growth, 1972-85	–1.4
Average annual openings, 1972-85	4,400
Growth	–200
Replacements	4,600

Available training data:

MDTA:

OJT enrollments	7
Institutional completions	67
Job Corps completions	151
Apprenticeship completions	997

Waiters and waitresses. Although most waiters and waitresses pick up their skills on the job, some attend special training courses offered by some public and private schools and restaurant associations. Most employers prefer applicants to have had at least 2 or 3 years of high school.

Employment, 1972	1,124,000
Projected 1985 requirements	1,300,000

Percent growth, 1972-85	16.6
Average annual openings, 1972-85	86,000
Growth	14,000
Replacements	72,000

Available training data:

MDTA:	
OJT enrollments	8
Institutional completions	29
Job Corps completions	106

Personal service occupations

Barbers. All States require barbers to be licensed. To obtain a license a person must have graduated from a State-approved barber school, have completed the eighth grade, meet certain health requirements, and be at least 16 (in some States 18). Nearly all States require a beginner to take an examination for an apprentice license, and then, after 1 or 2 years of work, take a second examination for a license as a registered barber.

Employment, 1972	157,000
Projected 1985 requirements	147,000
Percent growth, 1972-85	−6.4
Average annual openings, 1972-85	5,000
Growth	−800
Replacements	5,800

Available training data:

MDTA:	
Institutional completions	26
Job Corps completions	7
Vocational education completions:	
Secondary	304
Postsecondary	581

Bellmen and bell captains. Although no specific educational requirements exist for bellmen, graduation from high school enhances opportunities for promotion to front office clerk jobs.

Employment, 1972	16,000
Projected 1985 requirements	18,000
Percent growth, 1972-85	13.0
Average annual openings, 1972-85	600
Growth	200
Replacements	400

Available training data:

MDTA:	
Institutional completions	50

Cosmetologists. All States require that cosmetologists be licensed. Most States require applicants for licensing to be at least 16 years old and to have completed at least the 10th grade. Successful completion of a State-approved cosmetology course is recognized as adequate preparation for a State licensing examination; in some States, a period of apprenticeship may be substituted.

Employment, 1972	500,000
Projected 1985 requirements	670,000
Percent growth, 1972-85	35.0
Average annual openings, 1972-85	51,000
Growth	13,000
Replacements	38,000

MDTA:	
OJT enrollments	4
Institutional completions	50
Job Corps completions	277

Vocational education completions:

Secondary	8,631
Postsecondary	4,313

Funeral directors and embalmers. All States require embalmers to be licensed. While licensing standards vary by State, an embalmer generally must be 21, have a high school diploma or its equivalent, graduate from a mortuary science school, serve an apprenticeship, and pass a State board examination. One-half of the States require a year or more of college in addition to training in mortuary science.

Forty-four States require funeral directors to be licensed. Qualifications are similar to those for embalmers, but some States have special apprenticeship training and board examinations for directors. Most people obtain both licenses.

Employment, 1972	45,000
Projected 1985 requirements	45,000
Percent growth, 1972-85	0.0
Average annual openings, 1972-85	1,300
Growth	0
Replacements	1,300
Available training data	–

Private household service occupations

Private household workers. For most household worker jobs, there are no formal educational requirements. Instead, the ability to cook, sew, wash and iron, clean house, and care for children is important. Many of the necessary skills are learned in the home; more advanced skills can be learned in home economics courses in public and private schools.

Employment, 1972	1,437,000
Projected 1985 requirements	1,000,000
Percent growth, 1972-85	−30.8
Average annual openings, 1972-85	51,000

Growth	–35,000
Replacements	86,000

Available training data:

MDTA:	
OJT enrollments	21
Institutional completions	17
Job Corps completions	6

Protective and related service occupations

Firefighters. In most communities, qualifying examinations are open to applicants who have a high school education. The examinations test intelligence as well as strength, stamina, and agility. Those who score the highest on these examinations have the best chances for appointment. Beginners in large fire departments generally are trained for several weeks at the city's fire school before being assigned to local fire companies. Fire departments frequently conduct training programs and many colleges and universities offer courses related to fire prevention.

Employment, 1972	200,000
Projected 1985 requirements	315,000
Percent growth, 1972-85	57.2
Average annual openings, 1972-85	11,600
Growth	8,800
Replacements	2,800

Available training data:

Vocational education completions:	
Secondary	55
Postsecondary	1,032

Guards and watchmen. Although there are no specific educational requirements, most employers prefer guards and watchmen who are high school graduates. Applicants with less than a high school education usually are tested for reading and writing skills and their competence in following written and oral instructions. Skills are generally learned on the job.

Employment, 1972	250,000
Projected 1985 requirements	320,000
Percent growth, 1972-85	29.3
Average annual openings, 1972-85	19,300
Growth	5,600
Replacements	13,700

Available training data:

MDTA:	
OJT enrollments	24

Police officers (municipal). In many police departments, applicants must have a high school education. A few cities require some college training and some hire law enforcement students as police interns. A few departments accept persons who have less than a high school education as recruits, particularly if they have worked in a field related to law enforcement. Candidates must be U.S. citizens, usually at least 21 years of age. In small communities police officers often are trained on the job; in large cities formal training that ranges from a few weeks to months is provided.

Employment, 1972	370,000
Projected 1985 requirements	490,000
Percent growth, 1972-85	32.3
Average annual openings, 1972-85	14,300
Growth	9,300
Replacements	5,000

Available training data:

MDTA:	
Institutional completions	202
Job Corps completions	1
Vocational education completions:	
Secondary	[1] 788
Postsecondary	[1] 7,478

[1] Municipal and State police officers combined.

State police officers. All candidates must be citizens of the United States. In addition, most States require applicants to have a high school education or an equivalent combination of education and experience and be at least 21 years old. In all States, recruits enter a formal training program of several months.

Employment, 1972	44,000
Projected 1985 requirements	66,000
Percent growth, 1972-85	50.8
Average annual openings, 1972-85	2,300
Growth	1,700
Replacements	600

Available training data:

Vocational education completions:	
Secondary	[1] 788
Postsecondary	[1] 7,478
Junior college graduates	6,873

[1] Municipal and State police officers combined.

Health and regulatory inspectors (government). Most health and regulatory inspectors are required to have several years of experience in a field related to the area in which they will work. Often a bachelor's degree or several years of college with courses in applicable subjects may be substituted for some or all of the required years of experience. On-the-job training is provided in many inspector jobs where specialized knowledge is necessary. Applicants for Federal jobs are often required to take the Professional and Administrative Career Examination (PACE).

Employment, 1972	25,000
Projected 1985 requirements	35,000
Percent growth, 1972-85	48.4
Average annual openings, 1972-85	1,700
Growth	900
Replacements	800

Available training data:

Vocational education completions:

Secondary	600
Postsecondary	557
Junior college graduates	145

Construction inspectors (government). Construction inspectors receive most of their training on the job. Applicants are generally required to have several years of experience as a construction contractor, supervisor, or craftworker. Federal, State, and most local governments also require a high school diploma. Many employers prefer inspectors to be graduates of an apprenticeship program or have 2 years of college courses in architecture, engineering, construction technology, and blueprint reading.

Employment, 1972	23,000
Projected 1985 requirements	30,000
Percent growth, 1972-85	30.3
Average annual openings, 1972-85	1,500
Growth	500
Replacements	1,000

Available training data:

Vocational education completions:

Secondary	600
Postsecondary	557

Other service occupations

Mail carriers. These workers must be at least 18 and pass a written examination that tests reading ability, the ability to follow oral instructions, general intelligence, and the ability to do general arithmetic. If the job involves driving, the applicant must have a driver's license and pass a road test. Applicants must also pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds.

Employment, 1972	263,000
Projected 1985 requirements	300,000
Percent growth, 1972-85	14.1
Average annual openings, 1972-85	7,900
Growth	2,900
Replacements	5,000
Available training data	—

Telephone operators. New operators receive on-the-job training to become familiar with equipment, records, and work activities. After about 1 to 3 weeks of instruction they are assigned to regular operator jobs.

Employment, 1972	230,000
Projected 1985 requirements	232,000
Percent growth, 1972-85	1.5
Average annual openings, 1972-85	16,000
Growth	200
Replacements	15,800

Available training data:

Job Corps completions	7

Education and Related Occupations

Teaching occupations

Kindergarten and elementary and secondary school teachers. All States require teachers in public elementary schools to be certified by the department of education in the State in which they work. Some States also require teachers in private and parochial schools to be certified. A bachelor's degree which includes student-teaching and a certain number and type of education courses is the general minimum requirement for certification. A master's degree or equivalent is required by some States within a certain period after initial certification. Local school systems sometimes have additional requirements for employment.

All secondary teachers in public schools, and in some States those in private and parochial chools, must be certified. A bachelor's degree is the minimum educational requirement for a certificate. Twelve States require additional education, usually a fifth year of study or a master's degree, within a certain period after beginning employment. The number and type of education courses and subject specialty courses required and the type of student teaching preferred vary among the States and school systems.

To meet the projected need for about 2.8 million elementary and secondary teachers (340,000 for growth, 2.4 million for replacement, 35,000 not meeting certification requirements) between 1972 and 1985, an annual average of about 215,000 persons must enter the profession each year over the 13-year period.

New degree recipients, reentrants, and delayed entrants are the primary sources of teacher supply. Nearly 14.6 million bachelor's degrees are expected to be awarded between 1972 and 1985. In the recent past, about one-fifth of all recipients of bachelor's degrees have met certification requirements for high school teaching and 1 out of 8 has qualified for certification as an elementary school teacher. In addition, in 1972, 40,000 people received master's degrees and qualified for certification. However, for many reasons, not all who have certificates become teachers. Some are unable to find teaching positions in a preferred locale, others find higher salaries or better working conditions in another field. Through most of the 1960's, about 4 out of 5 new graduates certified to teach in elementary schools actually entered the field; about 2 out of 3 who met the high school requirements taught in high school. In recent years, however, these ratios have declined to 3 out of 4 and 3 out of 5, respectively—reflecting the deterioration in the supply-demand situation for teachers.

In past years, other entrants—mostly reentrants—have constituted an estimated one-third to two-fifths of all entrants to teaching. If the number of reentries each year through 1985 is governed by the number of teachers who left the field 8 years previously (since the average separation for teachers is believed to be about 8 years), about 800,000 reentering teachers would be added to supply during this period. Altogether, the number of persons seeking to enter elementary and secondary teaching, if past patterns of entry were to continue, would be nearly 4.4 million, almost three-fifths more than requirements.

	Total	*Kindergarten and elementary school teachers*	*Secondary school teachers*
Employment, 1972	2,297,000	1,274,000	1,023,000
Projected 1985 requirements	2,635,000	1,590,000	1,044,000
Percent growth, 1972-85	14.7	24.9	2.1
Average annual openings, 1972-85	145,000	105,000	40,000
Growth	25,600	24,000	1,600
Replacements	119,400	[1]81,000	[2]38,400
Available training data:[3]	210,000	90,000	120,000

[1] In addition to 81,000 deaths and retirements a year, another 21,000 to replace those who shift to another profession each year, and 2,200 a year to replace substandard teachers are required.

[2] In addition to deaths and retirements of 38,400 a year, another 47,000 to replace those who shift to another profession each year, and 500 a year to replace substandard teachers are required.

[3] Represents the number of bachelor's and master's degree recipients who were prepared to teach and who actually entered the profession in the fall of 1971.

The preceding analysis indicates that teacher training could be curtailed sharply and manpower requirements still be met. Because of the very large number of individuals involved, educational planning for elementary and especially secondary school teachers is expected to be one of the major problems for educational planners, particularly throughout the remainder of the 1970's.

College and university teachers. At least a master's degree is required for most beginning instructor positions, although a Ph.D. is generally preferred in universities. Specialization in some subject field is necessary. Advancement to assistant professor, to associate professor, and then to a full professorship requires progressive amounts of teaching experience and usually additional education. Currently, more than one-half of the faculty in universities have doctoral degrees compared with less than 10 percent of the faculty in 2-year colleges.

Manpower needs for college teachers (instructors or above) of degree credit courses are expected to average about 24,000 annually between 1972 and 1985. To meet this projected demand from Ph.D. recipients only, colleges and universities would have to grant an average of 48,000 each year during the 1972-85 period in order to provide an adequate supply. (In the past, about one-half of all Ph.D. recipients entered college teaching.) The U.S. Office of Education projects that the number of doctorate degrees will average about 48,600 over this period. Thus, projected output of Ph.D.'s alone would be adequate to meet the needs for college teachers. As a result, individuals with master's degrees may have considerable difficulty in obtaining jobs as college and university teachers.

Employment, 1972	525,000
Projected 1985 growth	630,000
Percent growth, 1972-85	20.4
Average annual openings, 1972-85	24,000
Growth	8,200
Replacements	15,800
Available training data	—

Library occupations

Librarians. Completion of a 1-year master's degree program in library science is usually required for professional librarians in public, academic, and special libraries. For librarians in school libraries, a bachelor's degree in education with specialization in librarianship or audiovisual technology is the basic requirement, although a master's degree is preferred.

New graduates and reentrants are the primary sources of librarians. To meet projected needs between 1972 and 1985, the number of persons entering the profession must average 11,200 a year—a figure that is expected to be equaled by bachelor's and master's degree recipients, according to the U.S. Office of Education projections. As a result, the number of openings available to persons other than new graduates is likely to be sharply curtailed.

Employment, 1972	120,000
Projected 1985 requirements	162,000
Percent growth, 1972-85	35.0
Average annual openings, 1972-85	11,200
Growth	3,200
Replacements	8,000

Available training data:

	1970-71	*Projected 1972-85 (annual average)*
Bachelor's degrees	1,013	1,419
Master's degrees	7,001	10,259
Doctor's degrees	39	55

Sales Occupations

Automobile parts countermen. Most countermen learn their skills on the job. Up to 2 years' working experience may be necessary before an employee is fully qualified. Employers prefer to hire high school graduates. High school or vocational school courses in auto mechanics, commercial arithmetic, salesmanship, and bookkeeping are helpful. Experience gained through gasoline service station work also is an asset to the prospective parts counterman.

Employment, 1972	72,000
Projected 1985 requirements	95,000
Percent growth, 1972-85	32.0
Average annual openings, 1972-85	3,400
Growth	1,800
Replacements	1,600

Available training data:

MDTA:

Institutional completions	9

Automobile salesworkers. Most beginning salesworkers are trained on the job, although large firms sometimes provide formal classroom training. Many employers require beginning automobile salesworkers to be at least 21 years old and high school graduates. Courses in public speaking, commercial arithmetic, business law, and salesmanship are useful. Previous sales experience or work requiring contact with the public also is helpful.

Employment, 1972	131,000
Projected 1985 requirements	148,000
Percent growth, 1972-85	13.0
Average annual openings, 1972-85	4,600
Growth	1,300
Replacements	3,300

Available training data:

Vocational education completions:

Secondary	3,207
Postsecondary	296
Junior college completions	9,237

Automobile service advisors. Trainees are usually selected from the employees in the employer's organization. For example, a person may apply for a job as service advisor trainee after gaining experience as mechanic or parts counterman trainees. Service advisors are trained on the job and usually can become qualified after 1 to 2 years of experience.

Employment, 1972	21,000
Projected 1985 requirements	28,000
Percent growth, 1972-85	32.6
Average annual openings, 1972-85	900
Growth	500
Replacements	400

Available training data:

Vocational education completions:

Secondary	3,207
Postsecondary	296
Junior college completions	9,237

Gasoline service station attendants. Applicants should have a driver's license, a general understanding of how an automobile works, and some sales ability. A high school education is usually not required except for service station management training programs conducted by oil companies. Most attendants are trained on the job.

Employment, 1972	435,000
Projected 1985 requirements	545,000
Percent growth, 1972-85	25.2
Average annual openings, 1972-85	15,400
Growth	8,400
Replacements	7,000

Available training data:

MDTA:

Institutional completions	4
Job Corps completions	145

Insurance agents and brokers. Although generally not required, a college education is helpful to an insurance agent or broker. Courses in accounting, economics, business law, and insurance are helpful. Some insurance companies sponsor classes in sales and insurance principles; other training is available from local educational institutions or through correspondence courses. All agents and most brokers must be licensed in the State where they sell insurance. To receive a license, most States require candidates to pass a written examination in insurance fundamentals and State insurance laws.

Employment, 1972	385,000
Projected 1985 requirements	450,000
Percent growth, 1972-85	16.7
Average annual openings, 1972-85	16,000
Growth	5,000
Replacements	11,000

Available training data:

Vocational education completions:

Secondary	364
Postsecondary	132
Junior college graduates	9,237

Manufacturers' salesworkers. Increasingly, employers prefer college graduates for positions as manufacturers' salesworkers, although many persons succeed with little or no post-high school training. Employer preferences for college training in a specified field vary with the nature of the product sold. Training at a college of pharmacy usually is required of drug manufacturer salesworkers; industrial salesworkers often need a scientific or technical background. Beginners usually are given specialized training before they start to work. Some companies have formal training programs, which may last from 1 to 2 years; other firms offer classroom instruction followed by additional training on the job under supervision of field managers.

Employment, 1972	423,000
Projected 1985 requirements	545,000
Percent growth, 1972-85	28.9
Average annual openings, 1972-85	20,000
Growth	9,000
Replacements	11,000

Available training data:

Vocational education completions:

Secondary	828
Postsecondary	1,031

Real estate salesworkers and brokers. A high school diploma is the minimum education preferred by employers who hire real estate salesworkers. Most salesworkers have some college training and many are college graduates. Courses in real estate, psychology, economics, finance, and business are helpful. Many firms offer their own training programs for beginners and experienced workers. Courses are available at local colleges and universities.

All States and the District of Columbia require real estate salesworkers and brokers to be licensed. Licensing requires the passing of a written examination. In over half the States, brokers also must have a specific amount of selling experience or equivalent education.

Employment, 1972	349,000
Projected 1985 requirements	435,000
Percent growth, 1972-85	25.4
Average annual openings, 1972-85	25,000
Growth	7,000
Replacements	18,000

Available training data:

Vocational education completions:

Secondary	713
Postsecondary	4,265
Junior college graduates	9,237

Retail trade salesworkers. Although not essential, employers prefer to hire high school graduates for retail sales positions. Salesmanship, home economics, and commercial arithmetic are among the high school subjects that are useful in a sales career. Most salesworkers are trained on the job; but, part-time selling experience gained while still in school may be helpful in obtaining full-time sales employment. In larger stores, applicants may spend a few days in formal training sessions before beginning actual sales work.

Employment, 1972	2,778,000
Projected 1985 requirements	3,330,000
Percent growth, 1972-85	20.0
Average annual openings, 1972-85	190,000
Growth	40,000
Replacements	150,000

Available training data:

MDTA:[1]

Institutional completions	7
Job Corps completions	175

[1] Includes training for wholesale trade.

Routemen. In most States, a routeman is required to have a chauffeur's license. Most employers require routemen to be high school graduates and preferably over 25 years of age. Most companies train new workers on the job.

Employment, 1972	190,000
Projected 1985 requirements	200,000
Percent growth, 1972-85	4.7
Average annual openings, 1972-85	3,700
Growth	700
Replacements	3,000
Available training data	—

Securities salesworkers. A college education is increasingly necessary for beginners seeking to enter this field. A degree in business administration, economics, finance, or liberal arts is good preparation for securities sales work; successful sales or managerial experience also is very helpful. Almost all States require persons who sell securities to be licensed. Personal bonds and written examinations are required to obtain this license. In addition, practically all salesworkers must be registered as representatives of their firm according to the regulations of the securities exchanges through which they do business, or the National Association of Securities Dealers, Inc. Examinations and character investigations are required for registration.

Most firms provide training for beginners, which may vary from short informal programs to combined classroom instruction and on-the-job experience lasting 6 months or more.

Employment, 1972	220,000
Projected 1985 requirements	290,000
Percent growth, 1972-85	28.0
Average annual openings, 1972-85	11,900
Growth	4,800
Replacements	7,100
Available training data	—

Wholesale trade salesworkers. High school graduation is the usual educational requirement for a wholesale salesworker, although selling scientific or technical equipment often requires training beyond high school. In some cases, engineering degrees are necessary. A beginner usually is trained on the job in several nonselling positions before being assigned as a salesworker. Generally 2 years or longer are required before a trainee is ready for his or her own sales territory.

Employment, 1972	688,000
Projected 1985 requirements	860,000
Percent growth, 1972-85	25.2
Average annual openings, 1972-85	31,000
Growth	13,000
Replacements	18,000
Available training data:	
Vocational education completions:	
Secondary	43,271
Postsecondary	6,463
Junior college graduates	9,237

Construction Occupations

Asbestos and insulation workers. Most asbestos workers learn their trade through a 4-year "improvership" program where they learn to use the tools of the trade and to work with insulating materials. Improvership programs are similar to apprenticeships.

Employment, 1972	30,000
Projected 1985 requirements	40,000
Percent growth, 1972-85	33.3
Average annual openings, 1972-85	1,200
Growth	800
Replacements	400
Available training data:	
MDTA:	
OJT enrollments	33
Apprenticeship completions[1]	282

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[1] "Improvership" and apprenticeship are interchangeable in reference to asbestos and insulation workers.

Bricklayers. Completion of a 3-year apprenticeship program is the recommended training for bricklayers. A high school education or its equivalent is important for entry to apprenticeship programs. Training may also be obtained informally on the job. Some skills of the trade may be obtained through vocational school courses.

During the 1960's and early 1970's apprenticeship completions numbered slightly more than one-half of openings resulting from growth and deaths and retirements.

Employment, 1972	180,000
Projected 1985 requirements	225,000
Percent growth, 1972-85	25.0
Average annual openings, 1972-85	6,600
Growth	3,500
Replacements	3,100
Available training data:	
MDTA:	
OJT enrollments	217
Institutional completions	137
Job Corps completions	771
Apprenticeship completions[1]	1,998

[1] Includes stonemasons, marble setters, and tile setters.

Carpenters. A 4-year apprenticeship program, including

144 hours of classroom instruction, is recommended. Training may also be acquired on the job. A high school education or its equivalent is desirable. Some knowledge of the trade may be obtained through vocational school courses.

During the 1960's and early 1970's, apprenticeship completions numbered about 15 percent of openings resulting from growth and deaths and retirements.

Employment, 1972	1,045,000
Projected 1985 requirements	1,200,000
Percent growth, 1972-85	14.8
Average annual openings, 1972-85	37,000
Growth	12,000
Replacements	25,000

Available training data:

MDTA:	
OJT enrollments	1,532
Institutional completions	446
Job Corps completions	2,266
Vocational education completions:	
Secondary	13,608
Postsecondary	2,364
Apprenticeship completions	5,054

Cement masons. A 3-year apprenticeship program that includes classroom instruction is recommended, but a substantial number of workers learn the trade on the job. Education above the grade school level is desirable.

During the 1960's and early 1970's, apprenticeship completions numbered about 15 percent of openings resulting from growth and deaths and retirements.

Employment, 1972	75,000
Projected 1985 requirements	110,000
Percent growth, 1972-85	46.7
Average annual openings, 1972-85	4,100
Growth	2,700
Replacements	1,400

Available training data:

MDTA:	
OJT enrollments	260
Job Corps completions	432
Apprenticeship completions	825

Construction laborers. Little formal training is required for work as a building or construction laborer. Employers generally seek young men who are at least 18 years of age and in good physical condition.

Employment, 1972	876,000
Projected 1985 requirements	1,000,000
Percent growth, 1972-85	14.2
Average annual openings, 1972-85	24,500
Growth	9,500
Replacements	15,000

Available training data:

MDTA:	
Institutional completions	223
Job Corps completions	21

Electricians (construction). A high school education is required for electrician jobs. An apprenticeship program lasting 4 years and including 144 hours of classroom instruction each year is recommended. Training may also be acquired on the job. Some skills of the trade may be acquired through vocational school courses. Most cities require electricians to pass licensing examinations.

During the 1960's and early 1970's, apprenticeship completions numbered about 60 percent of openings resulting from growth and deaths and retirements in the construction industry, but many individuals who completed electrician training went into other industries.

Employment, 1972	240,000
Projected 1985 requirements	325,000
Percent growth, 1972-85	35.4
Average annual openings, 1972-85	11,100
Growth	6,500
Replacements	4,600

Available training data:

MDTA:	
OJT enrollments	33
Institutional completions	404
Job Corps completions	523
Vocational education completions:	
Secondary	1,951
Postsecondary	1,750
Apprenticeship completions[1]	5,991

[1] All electricians, including maintenance.

Elevator constructors. A high school education is required. Training is obtained through employment as an elevator constructor helper. At least 2 years of continuous job experience including 6 months' on-the-job training at the factory of a major elevator firm is usually necessary. The helper-trainee generally attends evening classes in vocational schools.

Employment, 1972	17,000
Projected 1985 requirements	25,000
Percent growth, 1972-85	47.1
Average annual openings, 1972-85	1,000
Growth	600
Replacements	400
Available training data	–

Floor covering installers. Employers prefer that floor covering installers have a high school education. Although many workers acquire their skills through informal training, a 3- to 4-year apprenticeship program, including related classroom instruction, is recommended.

Employment, 1972	75,000
Projected 1985 requirements	100,000
Percent growth, 1972-85	33.3
Average annual openings, 1972-85	3,200
Growth	1,900
Replacements	1,300

Available training data:

MDTA:

OJT enrollments	30
Institutional completions	11
Apprenticeship completions	256

Glaziers (construction). Although many glaziers learn the trade informally on the job, a 3-year apprenticeship is recommended. A high school diploma is required for entry into apprenticeship programs.

During the 1960's and early 1970's, apprenticeship completions numbered nearly 50 percent of openings resulting from growth and deaths and retirements in the construction industry, but some individuals who completed glazier training went into other industries.

Employment, 1972	12,000
Projected 1985 requirements	18,000
Percent growth, 1972-85	50.0
Average annual openings, 1972-85	700
Growth	500
Replacements	200

Available training data:

MDTA:

OJT enrollments	8
Apprenticeship completions	335

Lathers. Although many lathers acquire their skills informally on the job, a 2-year apprenticeship is recommended. Employers prefer high school graduates.

During the 1960's and early 1970's, apprenticeship completions numbered slightly more than 35 percent of openings resulting from growth and deaths and retirements.

Employment, 1972	30,000
Projected 1985 requirements	40,000
Percent growth, 1972-85	33.3
Average annual openings, 1972-85	1,100
Growth	800
Replacements	300

Available training data:

MDTA:

OJT enrollments	2
Apprenticeship completions	276

Operating engineers. A 3-year apprenticeship program is the recommended training. A high school education is required for these programs. Training may also be obtained informally on the job by oilers (operating engineers' assistants) and helpers to heavy equipment repairmen.

Employment, 1972	435,000
Projected 1985 requirements	570,000
Percent growth, 1972-85	31.0
Average annual openings, 1972-85	18,500
Growth	10,500
Replacements	8,000

Available training data:

MDTA:

OJT enrollments	388
Institutional completions	70
Job Corps completions	1,146
Apprenticeship completions	1,035

Painters and paperhangers. A high school education is preferred but not essential for painter and paperhanger employment. Although a 3-year formal apprenticeship program including related classroom instruction is recommended, training may also be obtained informally, on the job. Some skills of the trade may be acquired through vocational school courses.

During the 1960's and early 1970's, apprenticeship completions numbered less than 10 percent of openings resulting from growth and deaths and retirements.

Employment, 1972	420,000
Projected 1985 requirements	460,000
Percent growth, 1972-85	9.5
Average annual openings, 1972-85	14,700
Growth	3,100
Replacements	11,600

Available training data:

MDTA:

OJT enrollments	238
Institutional completions	12
Job Corps completions	658
Apprenticeship completions	983

Plasterers. A 3- to 4-year apprenticeship including classroom instruction is recommended, but many learn the trade on the job by working as plasterers' helpers or laborers.

Employment, 1972	30,000
Projected 1985 requirements	32,000

Percent growth, 1972-85	6.6
Average annual openings, 1972-85	900
Growth	200
Replacements	700

Available training data:

MDTA:

OJT enrollments	17
Job Corps completions	75
Apprenticeship completions	245

Plumbers and pipefitters. A 5-year apprenticeship including related classroom instruction is recommended but many learn the trade informally on the job. Employers prefer high school graduates. Some skills may be acquired through vocational school courses. Some localities require workers to pass a licensing examination.

Employment, 1972	400,000
Projected 1985 requirements	500,000
Percent growth, 1972-85	25.0
Average annual openings	16,300
Growth	7,700
Replacements	8,600

Available training data:

MDTA:

Institutional completions	112
Job Corps completions	165
Apprenticeship completions[1]	5,663
Secondary	1,339
Postsecondary	464

[1] Includes sprinkler-fitters.

Roofers. A 3-year apprenticeship including related classroom instruction is recommended for roofing work. Training also may be acquired informally on the job. A high school education is desirable for roofers.

Employment, 1972	80,000
Projected 1985 requirements	110,000
Percent growth, 1972-85	37.5
Average annual openings, 1972-85	3,400
Growth	2,300
Replacements	1,100

Available training data:

MDTA:

OJT enrollments	5
Apprenticeship completions	383

Sheet-metal workers. A 4-year apprenticeship program including classroom instruction is recommended for sheet-metal workers. A high school education is required for entry to apprenticeship programs. Many workers in this trade acquire their skill informally on the job. Skills of the trade may also be acquired through vocational courses.

During the 1960's and early 1970's, the number of apprenticeship completions was greater than openings for sheet-metal workers in the construction industry, but many individuals completing sheet-metal training went into other industries.

Employment, 1972	65,000
Projected 1985 requirements	80,000
Percent growth, 1972-85	23.1
Average annual openings, 1972-85	2,300
Growth	1,200
Replacements	1,100

Available training data:

MDTA:

OJT enrollments	15
Institutional completions	113
Job Corps completions	211
Apprenticeship completions	2,768

Structural, ornamental, and reinforcing ironworkers, riggers, and machine movers. A 3-year apprenticeship program including related classroom instruction is recommended for these jobs. A high school education is desirable.

During the 1960's and early 1970's, apprenticeship completions numbered about 30 percent of openings resulting from growth and deaths and retirements.

Employment, 1972	95,000
Projected 1985 requirements	120,000
Percent growth, 1972-85	26.3
Average annual openings, 1972-85	3,400
Growth	1,900
Replacements	1,500

Available training data:

MDTA:

OJT enrollments	227
Institutional completions	209
Apprenticeship completions	2,098

Occupations in Transportation Activities

Air transportation occupations

Air traffic controllers. Trainees are selected through the competitive Federal Civil Service System. Applicants must have 3 years of progressively responsible work experience that demonstrates their potential and/or a college degree. Successful applicants receive both on-the-job and formal training. It usually takes 2 to 3 years of on-the-job training and experience to become a fully qualified controller.

Employment, 1972	19,500
Projected 1985 requirements	26,000
Percent growth, 1972-85	33.8
Average annual openings, 1972-85	800
Growth	500
Replacements	300
Available training data	–

Aircraft mechanics. High school graduates are preferred. Mechanics may prepare for the trade by working as trainees, apprentices, or helpers to experienced mechanics. The larger airlines train apprentices in a carefully planned 3- or 4-year program of instruction and work experience. Other mechanics prepare for their trade by graduating from a mechanics school approved by the Federal Aviation Administration (FAA). Most of these schools have an 18- to 24-month program. To complete inspections required by the FAA, a mechanic must be licensed by the FAA as an airframe mechanic, a powerplant mechanic, or both.

Employment, 1972	123,000
Projected 1985 requirements	190,000
Percent growth, 1972-85	53.0
Average annual openings, 1972-85	7,000
Growth	5,000
Replacements	2,000
Available training data:	
Apprenticeship completions	65

Airline dispatchers. A Federal Aviation Administration certificate is required for airline dispatcher jobs. To qualify for this certificate, an applicant (1) must spend at least a year in dispatching and work under the supervision of a certified dispatcher; or (2) complete an FAA-approved dispatcher's course at a school or airline training center; or (3) spend 2 of the 3 previous years as an air traffic controller, dispatch clerk, assistant dispatcher, or radio operator, or in similar work in military service. Although assistant dispatchers may not need certification, 2 years of college or an equivalent amount of time working in some phase of air transportation is required.

Employment, 1972	800
Projected 1985 requirements	800
Percent growth, 1972-85	0.0
Average annual openings, 1972-85	20
Growth	0
Replacements	20
Available training data	–

Flight attendants. Applicants must be high school graduates, and those who have 2 years of college, nurses' training, or experience in dealing with the public are preferred. Most large airlines train their own flight attendants; those that do not operate schools generally send trainees to another airline's school.

Employment, 1972	39,000
Projected 1985 requirements	76,000
Percent growth, 1972-85	92.4
Average annual openings, 1972-85	8,000
Growth	2,500
Replacements	5,500
Available training data	–

Flight engineers. Applicants generally are required to have a commercial pilot's license and usually a flight engineer's license as well, although some airlines may train those who have only a pilot's license. Applicants can qualify for a flight engineer's license if they have had 3 years of experience in repairing or overhauling aircraft and engines or experience as a pilot or flight engineer in the Armed Forces. Completing a ground and flight instruction course approved by the Federal Aviation Administration is the most common method of qualifying for a license.

Employment, 1972	7,000
Projected 1985 requirements	9,500
Percent growth, 1972-85	35.7
Average annual openings, 1972-85	300
Growth	200
Replacements	100
Available training data	–

Ground radio operators and teletypists. At least a third-class radio-telephone or radio-telegraph operator's permit issued by the Federal Communications Commission is required. A second-class operator's permit is preferred. A high school education, a good speaking voice, the ability to type at least 40 words a minute, and a knowledge of standard codes and symbols used in communications are important qualifications for this work. Radio operators and teletypists first serve probationary periods during which they receive on-the-job training.

Employment, 1972	5,700
Projected 1985 requirements	5,000
Percent growth, 1972-85	–13.0
Average annual openings, 1972-85	100
Growth	–100
Replacements	200
Available training data	–

Pilots and copilots. All commercial pilots and copilots must be licensed by the Federal Aviation Administration and have a commercial pilot's license, a rating for the class of plane they fly, and an instrument rating. Flight training in the military services or in civilian flying schools satisfies the flight experience requirements for licensing. Most airlines also require 500 to 1,000 hours of flight time. Applicants hired by a scheduled airline usually start as flight engineers, although they may begin as copilots.

Employment, 1972	54,000
Projected 1985 requirements	78,000
Percent growth, 1972-85	43.8
Average annual openings, 1972-85	2,000
Growth	1,500
Replacements	500

Available training data:

Vocational education completions:

Secondary	76
Postsecondary	836

Traffic agents and clerks (civil aviation). Employers require a high school education and usually prefer applicants with some college training.

Employment, 1972	59,000
Projected 1985 requirements	110,000
Percent growth, 1972-85	88.7
Average annual openings, 1972-85	7,000
Growth	4,000
Replacements	3,000
Available training data	–

Merchant marine occupations

Merchant marine officers. Candidates must have at least 3 years of appropriate sea experience or be a graduate of an approved training program. Training may be obtained at either the U.S. Merchant Marine Academy, one of five State merchant marine academies, or in a trade union training program. Officer candidates also must pass a Coast Guard examination in a specific area of seamanship. While there are no educational requirements, formal training usually is needed to pass the examination for an officer's license.

Employment, 1972	15,000
Projected 1985 requirements	14,000
Percent growth, 1972-85	–9.8
Average annual openings, 1972-85	200
Growth	–100
Replacements	300
Available training data	–

Merchant seamen. Although not required, previous sea experience in the Coast Guard or Navy is helpful. In addition, applicants must obtain seaman's papers from the Coast Guard which qualify a person for consideration for a job. While most training programs are designed to help upgrade experienced workers, the Seafarers' International Union of North America operates a school that trains inexperienced young people in general seamanship.

Employment, 1972	42,000
Projected 1985 requirements	35,000
Percent growth, 1972-85	–16.7
Average annual openings, 1972-85	100
Growth	–500
Replacements	600

Available training data:

MDTA:

Institutional completions	16

Railroad occupations

Brakemen. Brakemen learn their skills on the job. It usually takes a year or so to thoroughly learn the job. Employers prefer applicants with a high school education.

Employment, 1972	73,000
Projected 1985 requirements	64,000
Percent growth, 1972-85	–12.5
Average annual openings, 1972-85	400
Growth	–700
Replacements	1,100
Available training data	–

Bridge and building workers (railroad). New employees usually work as helpers and receive their training on the job.

Employment, 1972	10,500
Projected 1985 requirements	9,900
Percent growth, 1972-85	–5.6
Average annual openings, 1972-85	200
Growth	–50
Replacements	250
Available training data	–

Clerks (railroad). A high school education is generally required. Railroads prefer workers who have training or some experience in working with figures.

Employment, 1972	82,600
Projected 1985 requirements	64,000
Percent growth, 1972-85	–22.5
Average annual openings, 1972-85	2,700
Growth	–1,400
Replacements	4,100
Available training data	–

Conductors (railroad) Qualified brakemen are promoted to conductors on a seniority basis. To qualify, a man usually must have several years' experience as a brakeman and pass examinations covering signals, air brakes, timetables, operating rules, and related subjects.

Employment, 1972	38,000
Projected 1985 requirements	33,000
Percent growth, 1972-85	−12.6
Average annual openings, 1972-85	700
Growth	−300
Replacements	1,000
Available training data	–

Locomotive engineers. Openings in engineer jobs are usually filled by training and promoting locomotive firemen according to seniority rules. Firemen qualify for promotion by proving their ability to operate locomotives and by passing a comprehensive exam on such subjects as mechanical and electrical equipment and train orders. A few railroads train brakemen and inexperienced workers for engineer jobs.

Employment, 1972	35,000
Projected 1985 requirements	33,500
Percent growth, 1972-85	−4.8
Average annual openings, 1972-85	1,000
Growth	−100
Replacements	1,100
Available training data	–

Locomotive firemen. Railroads prefer applicants who have a high school education. Firemen are trained on the job and in orientation sessions. After training, firemen are required to pass qualifying examinations.

Employment, 1972	14,900
Projected 1985 requirements	9,000
Percent growth, 1972-85	−38.4
Average annual openings, 1972-85	−300
Growth	−500
Replacements	200
Available training data	–

Shop trades (railroad). Apprenticeship training is a common way of entering the railroad shop trades, although many workers learn on the job and are upgraded from jobs as helpers and laborers.

Employment, 1972	78,000
Projected 1985 requirements	67,000
Percent growth, 1972-85	−14.2
Average annual openings, 1972-85	900
Growth	−800
Replacements	1,700
Available training data	–

Signal department workers. New employees are assigned as helpers to experienced workers. After about 60 to 90 days of training they may advance to assistants, and after another 2 to 4 years qualified assistants may be promoted to signalmen and signal maintainers. Railroads prefer applicants who are high school graduates.

Employment, 1972	11,200
Projected 1985 requirements	[illegible],500
Percent growth, 1972-85	−14.9
Average annual openings, 1972-85	−100
Growth	−200
Replacements	100
Available training data	–

Station agents. Station agents rise from the ranks of other railroad occupations. Experienced telegraphers, telephoners, towermen and clerks may advance to jobs as agents in small stations or assistants in larger ones.

Employment, 1972	8,700
Projected 1985 requirements	6,500
Percent growth, 1972-85	−25.2
Average annual openings, 1972-85	100
Growth	−150
Replacements	250
Available training data	–

Telegraphers, telephoners, and towermen. New workers receive on-the-job training that covers operating rules, train orders, and station operations. Most railroads require trainees to pass examinations on train operating rules and demonstrate ability to use the equipment before they can qualify. Most railroads prefer high school graduates.

Employment, 1972	11,200
Projected 1985 requirements	7,500
Percent growth, 1972-85	−33.2
Average annual openings, 1972-85	−200
Growth	−300
Replacements	100
Available training data	–

Track workers (railroad). Most learn their skills through on-the-job training that lasts about 2 years. Most railroads seek applicants between 21 and 45 who are able to read, write, and perform heavy work. Machine-operating jobs are assigned to qualified trackmen by seniority.

Employment, 1972	54,000
Projected 1985 requirements	47,000
Percent growth, 1972-85	−13.0
Average annual openings, 1972-85	900
Growth	−300
Replacements	1,200
Available training data	–

Driving occupations

Busdrivers, intercity. Most companies prefer applicants who have a high school education. Some States require the applicant to have a chauffeur's license. All drivers must be 21 and meet minimum health and experience qualifications established by the U.S. Department of

Transportation. Applicants must have 1 year's driving experience and a good driving record. On-the-job training usually lasts for 2 to 6 weeks but can extend to 3 months.

Employment, 1972	25,000
Projected 1985 requirements	24,500
Percent growth, 1972-85	−2.1
Average annual openings, 1972-85	500
Growth	0
Replacements	500
Available training data	–

Busdrivers, local transit. Many employers prefer applicants who have a high school education. Generally, a motor vehicle operator's permit and 1 or 2 years of driving experience are basic requirements. Most States require a chauffeur's license. Most companies train new workers on the job.

Employment, 1972	68 000
Projected 1985 requirements	71,500
Percent growth, 1972-85	5.5
Average annual openings, 1972-85	1,600
Growth	300
Replacements	1,300

Available training data:

MDTA:

OJT enrollments	64

Local truckdrivers. Qualifications vary considerably, depending on the type of truck and nature of the business. Some employers prefer applicants with at least 2 years of high school and experience in driving a truck. All applicants must have a chauffeur's license. Most local truck drivers are trained on the job.

Employment, 1972	1,600,000
Projected 1985 requirements	1,800,000
Percent growth, 1972-85	17.6
Average annual openings, 1972-85	46,000
Growth	21,000
Replacements	25,000

Available training data:

MDTA:

OJT enrollments	11
Institutional completions	30
Job Corps completions[1]	14

[1] May include over-the-road drivers.

Long-distance truckdrivers. Minimum qualifications are set by the U.S. Department of Transportation. Drivers must be 21, in good physical condition, have a good driving record, and pass a road test in the type of vehicle they will drive. In addition, they must pass an examination on the Motor Carrier Safety Regulations of the U.S. Department of Transportation. In most States, drivers must have a chauffeur's license. High school driver training courses or a program in a private driving school is good preparation.

Employment, 1972	570,000
Projected 1985 requirements	670,000
Percent growth, 1972-85	17.6
Average annual openings, 1972-85	16,600
Growth	7,700
Replacements	8,900

Available training data:

MDTA:

OJT completions	42
Institutional completions	290

Parking attendants. Although there are no specific educational requirements for parking attendants, employers prefer high school graduates. Clerical and arithmetic skills are helpful for attendants who keep records of claim tickets, compute parking charges, and make change. Also, a valid driver's license is required. Little or no specific training is required.

Employment, 1972	33,000
Projected 1985 requirements	38,000
Percent growth, 1972-85	14.0
Average annual openings, 1972-85	1,600
Growth	400
Replacements	1,200
Available training data	–

Taxi drivers. In most cities taxi drivers must have a State-issued chauffeur's license, as well as a special operator's license issued by the local police, safety department, or public utilities commission. Some companies teach the applicant taxicab regulations and the location of streets. Although formal education seldom is required, many companies prefer applicants who have at least an eighth grade education.

Employment, 1972	92,000
Projected 1985 requirements	85,000
Percent growth, 1972-85	−7.6
Average annual openings, 1972-85	1,600
Growth	−500
Replacements	2,100
Available training data	–

Conservation occupations

Foresters. A bachelor's degree with a major in forestry is generally required to become a forester. Teaching and doing research generally require advanced degrees. Training in forestry consists of courses ranging from forest ecology to forest administration and, in most colleges, includes field camp experience.

The number of graduates in forestry in 1971 was more than twice the number of expected annual openings in this occupation during the 1972-85 period. Competition for positions in forestry is intensified by entrants from other disciplines, forestry technicians, and forestry aides.

Employment, 1972	22,000
Projected 1985 requirements	28,000
Percent growth, 1972-85	26.0
Average annual openings, 1972-85	900
Growth	500
Replacements	400

Available training data:

Bachelor's degrees	1,826
Master's degrees	291
Doctor's degrees	92

Forestry aides and technicians. Completion of specialized 1- or 2-year postsecondary school curriculums, government-sponsored training programs, or experience in forest work such as planting trees or fighting fires will qualify technicians for beginning jobs. Postsecondary training can be obtained in technical institutes, junior or community colleges, and some universities. Specialized postsecondary courses include land surveying, tree identification, and aerial photograph interpretation. Students can gain experience in forestry by working in a forest or in a camp operated by their school. Forestry technician training is sponsored under Federal manpower programs.

Employment, 1972	14,500
Projected 1985 requirements	21,500
Percent growth, 1972-85	48.3
Average annual openings, 1972-85	800
Growth	500
Replacements	300

Available training data:

MDTA:	
Institutional completions	28
Job Corps completions	77
Junior college graduates	1,087

Range managers. The field of range management generally requires a bachelor's degree with a major in range management, range conservation, or a closely related field. Graduates who want to teach or do research generally need an advanced degree. Curriculums in range management usually include botany, animal husbandry, soils, mathematics, and other specialized courses. Many college students obtain experience through summer jobs with such Federal Government agencies as the Forest Service or Bureau of Land Management.

Employment, 1972	4,000
Projected 1985 requirements	4,500
Percent growth, 1972-85	12.5
Average annual openings, 1972-85	150
Growth	50
Replacements	100

Available training data:

Bachelor's degrees	136
Master's degrees	27
Doctor's degrees	15

Engineers

A bachelor's degree in engineering generally is required for most entry positions. However, workers in occupations closely related to engineering can become engineers after extensive experience plus some college-level training. Engineers in teaching and research positions should have a graduate degree. For some specialties, such as nuclear engineering, graduate school training is required. Engineers whose work affects life, health, or property, or those who offer their services to the public must be licensed in all 50 States and the District of Columbia.

New graduates with engineering majors are the primary source of engineers. However, limited data on past patterns of entry into the occupation indicate large numbers enter from other sources: workers who shift occupations (including technicians who are upgraded); persons not in the labor force (including those in the Armed Forces); immigrants; and college graduates with majors in fields other than engineering.[31] If past patterns continue, about 27,300 engineers annually would enter the field from these sources over the 1972-85 period. Under these assumptions, about 46,000 new engineering graduates would have to enter the field annually to meet requirements. Followup studies of new college graduates indicate that about 85 percent of all new bachelor's degree recipients in engineering eventually enter the profession. Therefore, about 54,000 engineering graduates would be needed annually to obtain the required number of new entrants.

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[31] Data on past patterns of entry are available from *Two Years After the College Degree–Work and Further Study Patterns* (National Science Foundation, 1963), and the *Postcensal Study of Professional and Technical Personnel*, a followup study of persons who were reported in professional and technical occupations in the 1960 Census. Selected data from the study are presented in *Technician Manpower: Requirements, Resources, and Training Needs*, Bulletin 1512 (Bureau of Labor Statistics, 1966). Data on scientists and engineers from abroad have been published by the National Science Foundation based on special tabulations prepared by the Immigration and Naturalization Service of the Department of Justice. Also see: "Projections of Manpower Supply in a Specific Occupation," by Neal H. Rosenthal, *Monthly Labor Review*, November 1966.

U.S. Office of Education projections of engineering degrees indicate that, for the 1972-85 period, the number of bachelor's degrees in engineering each year will average about 10 percent below the 54,000 needed to meet projected requirements.

Employment, 1972	1,100,000
Projected 1985 requirements	1,500,000
Percent growth, 1972-85	41.5
Average annual openings, 1972-85	73,500
Growth	34,000
Replacements	[1]39,500

Available training data:

	1970-71	Projected 1972-85 (annual average)
Bachelor's degrees	50,046	48,669
Master's degrees	16,443	16,815
Doctor's degrees	3,638	4,755

[1] Includes an estimated 20,600 replacements for those who transferred to other occupations.

Environmental scientists

Geologists. A bachelor's degree in geology is adequate training for most entry jobs, but geologists with some training in geophysical exploration techniques face less competition for jobs. Beginning positions in research and teaching usually require a master's degree. Those doing high level research or assuming administrative posts should have a Ph.D.

New college graduates with a major in geology are the major sources of supply. However, limited data on past patterns of entry into the occupation indicate that a significant number of workers have entered geology from other sources: new college graduates not majoring in geology, immigrants, persons not in the labor force, and persons employed in other occupations.[32] Although a variety of factors affect the number of these other entrants, including the relative availability of geology graduates, significant numbers probably will continue to enter. If past patterns of entry from other sources continue, about 700 geology graduates would enter the occupation each year. Historically, only about one-third of all graduates have entered the profession each year. Therefore, if past trends continue, an average of over 2,000 bachelor's degree graduates in geology would be needed annually to meet projected requirements.

Although projections of the U.S. Office of Education, based on past trends, show that the number of recipients of bachelor's degrees in geology will decline below the 1971 level of almost 2,400 each year over the 1972-85 period, this number of degrees would be in balance with requirements.

Employment, 1972	23,000
Projected 1985 requirements	32,000
Percent growth, 1972-85	37.5
Average annual openings, 1972-85	1,700
Growth	700
Replacements	[1]1,000

Available training data:

	1970-71	Projected 1972-85 (annual average)
Bachelor's degrees	2,359	2,027
Master's degrees	606	742
Doctor's degrees	289	337

[1] Includes an estimated 600 replacements for those who transfer to other occupations.

Geophysicists. Beginning jobs in geophysical exploration require a bachelor's degree in geophysics or a geophysical specialty, or a bachelor's degree in a related field of science or engineering with courses in geophysics, physics, geology, mathematics, chemistry, and engineering. Geophysicists doing research or supervising exploration activities should have graduate training in geophysics or a related science. Those planning to teach in colleges or do basic research should acquire a Ph.D. degree in geophysics or a related science with advanced courses in geophysics.

The projected number of openings for geophysicists, including transfers, is much greater than the projections of the annual average number of degrees to be granted in geophysics.

Employment, 1972	8,000
Projected 1985 requirements	11,000
Percent growth, 1972-85	38.3
Average annual openings, 1972-85	600
Growth	200
Replacements	[1]400

[1] Includes an estimated 200 replacements for those who transfer to other occupations.

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[32] See footnote 31, p. 54.

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Available training data:

Degrees in geophysics and seismology:

Bachelor's degrees	48
Master's degrees	40
Doctor's degrees	31

Meteorologists. Beginning jobs in meteorology require bachelor's degrees in meteorology or in a related science—usually physics, mathematics, or engineering, with courses in meteorology. For research jobs, teaching in colleges or universities, or management positions, an advanced degree is helpful.

Although the demand for entrants into this occupation each year is small, the number of new graduates who want to enter also is small. Projections of the U.S. Office of Education indicate a decline in the number of bachelor's degrees granted in meteorology during the 1972-85 period. Master's degrees are projected to increase slightly from 1971 levels and Ph.D. degrees are expected to remain approximately the same over the period.

Employment, 1972	5,000
Projected 1985 requirements	6,000
Percent growth, 1972-85	29.2
Average annual openings, 1972-85	200
Growth	100
Replacements	100

Available training data:

	1970-71	*Projected 1972-85 (annual average)*
Degrees in atmospheric sciences and meteorology:		
Bachelor's degrees	249	192
Master's degrees	153	189
Doctor's degrees	61	60

Oceanographers. Professional positions in oceanography such as research and college teaching require an advanced degree, preferably the Ph.D. A bachelor's degree in oceanography is sufficient for beginning jobs as research or laboratory assistants.

The number of new job openings each year due to growth of the occupation and replacement needs is roughly equal to the number of advanced degrees granted in 1971.

Employment, 1972	4,500
Projected 1985 requirements	6,300
Percent growth, 1972-85	33.0
Average annual openings, 1972-85	200
Growth	100
Replacements	100

Available training data:

Bachelor's degrees	228
Master's degrees	152
Doctor's degrees	52

Life science occupations

Life scientists. Entrants into life science occupations should have a bachelor's degree with a major in one of the natural sciences. Graduates seeking jobs in research and college teaching are generally required to have a master's degree. Persons in higher level college teaching, doing independent research, or administering research programs generally need a Ph.D.

New graduates with a major in one of the life sciences are the primary source of supply of life scientists. However, limited data on patterns of entry into the occupation indicate that a significant number of workers have entered from other sources: immigration, reentrants to the labor force; graduates with majors other than in the life sciences; and workers who transfer from other occupations.[33] Although a variety of factors, including the relative availability of life science graduates, affect the number of other entrants, significant numbers probably will continue to enter the occupation. If past patterns of entry from these sources continue, about 9,200 life science graduates would enter each year. Since less than one-third of those who receive bachelor's degrees in the life sciences in the past actually have entered the field, an average of 32,200 bachelor's degree graduates in the life sciences would be needed annually to meet projected requirements.

In 1971, over 48,400 bachelor's degrees were granted in the life sciences.[34] U.S. Office of Education projections show the average annual number of bachelor's degrees granted increasing by almost 30 percent above 1971 levels over the 1972-85 period. Thus, the rapid expansion of training in the life sciences could be sharply curtailed and manpower requirements could still be met.

Employment, 1972	180,000
Projected 1985 requirements	235,000
Percent growth, 1972-85	29.1
Average annual openings, 1972-85	14,600
Growth	4,100
Replacements	[1]10,500

[1] Includes an estimated 5,400 replacements for those who transfer to other occupations.

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[33] See footnote 31, p. 54.

[34] Includes only degrees awarded in agriculture and natural resources and biological sciences.

Available training data:

	1970-71	Projected 1972-85 (annual average)
Bachelor's degrees	48,415	62,722
Master's degrees	8,185	10,582
Doctor's degrees	4,731	6,552

Mathematics occupations

Mathematicians. Beginning mathematicians need a bachelor's degree in mathematics or an applied field such as physics or engineering with a minor in mathematics. Mathematicians doing research or working in some areas of applied mathematics need an advanced degree. Those seeking full faculty status at most colleges and universities should have a Ph.D.

The major source of mathematicians is new college graduates with degrees in mathematics. However, limited data on patterns of entry into the occupation indicate that in the past a significant number of workers enter mathematics from other sources such as persons entering from other occupations; reentrants into the labor force; immigrants; and new college graduates not majoring in mathematics.[35] Although a variety of factors, including the availability of mathematics graduates, affect the number of these other entrants, significant numbers probably will continue to enter the occupation. If past patterns of entry from these sources continue, about 5,300 mathematics graduates would enter each year. Fewer than one-fourth of those who receive bachelor's degrees in mathematics actually enter the field. Therefore, if past trends continue, about 23,700 bachelor's degree graduates in mathematics would be needed annually to meet projected requirements.

Projections of the U.S. Office of Education based on past trends of college studies show the average annual number of bachelor's degrees in mathematics increasing over 32 percent above the annual number required to meet expected needs. Thus, the rapid growth of training in mathematics could be curtailed and manpower requirements could still be met.

Employment, 1972	76,000
Projected 1985 requirements	107,000
Percent growth, 1972-85	40.8
Average annual openings, 1972-85	8,100
Growth	2,400
Replacements	[1]5,700

Available training data:

	1970-71	Projected 1972-85 (annual average)
Bachelor's degrees	24,801	31,318
Master's degrees	5,191	6,425
Doctor's degrees	1,199	1,734

[1] Includes an estimated 3,900 replacements for those who transfer to other occupations.

Statisticians. Beginning statisticians generally need a bachelor's degree with a major in statistics or mathematics to enter the occupation. For some statistical jobs, however, a bachelor's degree in economics or another applied field and a minor in statistics is preferable. Those seeking faculty positions at colleges and universities need an advanced degree.

Employment, 1972	23,000
Projected 1985 requirements	32,000
Percent growth, 1972-85	39.6
Average annual openings, 1972-85	1,700
Growth	700
Replacements	1,000

Available training data:

MDTA:	
OJT enrollments	1
Vocational education completions:	
Secondary	364
Postsecondary	132
Bachelor's degrees	214
Master's degrees	495
Doctor's degrees	185

Physical scientists

Chemists. A bachelor's degree with a major in chemistry is usually the minimum requirement for entry positions in analysis and testing, quality control, technical service and sales, or jobs as assistants to senior chemists in research and development laboratories. Graduate training is essential for many positions, particularly in research and college teaching, and is helpful for advancement in all types of work. Chemists with the master's degree often qualify for applied research positions in government or private industry. Those with the Ph.D. degree generally teach or do research in a college or university.

The major source of supply of chemists is from new graduates majoring in chemistry. However, limited data on past patterns of entry into the occupation indicate that a significant number of workers have entered chemistry from other sources such as immigration; persons reentering the labor force; graduates who did not major in chemistry; and persons entering from other occupations.[36] Although a variety of factors affect the number of other entrants, including the relative availability of chemistry graduates, significant numbers probably will continue to enter the occupation. If past patterns of entry from other sources continue, about 5,100 chemistry graduates would enter each year. Fewer than half of those who received bachelor's degrees in chemistry entered the field in the past. Therefore, if past trends continue, an average of more than 10,300 bachelor's degree graduates in chemistry would be needed annually to meet projected requirements.

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[35] See footnote 31, p. 54.

[36] See footnote 31, p. 54.

U.S. Office of Education projections indicate that the number of bachelor's degrees awarded in chemistry annually will average 11 percent below the number needed to meet requirements during the 1972-85 period. Therefore, although bachelor's degrees in chemistry can decline below the 1971 level of 11,000, projections indicate they are declining too rapidly to meet requirements.

Employment, 1972	134,000
Projected 1985 requirements	184,000
Percent growth, 1972-85	38.0
Average annual openings, 1972-85	10,500
Growth	3,900
Replacements	[1]6,600

Available training data:

	1970-71	*Projected 1972-85 (annual average)*
Bachelor's degrees	11,037	9,222
Master's degrees	2,197	2,296
Doctor's degrees	1,952	1,641

[1] Includes an estimated 3,700 replacements for those who transfer to other occupations.

Food scientists. Beginning food scientists need at least a bachelor's degree with a major in food science or one of the physical or life sciences such as chemistry and biology. Those planning to do applied research and development or college teaching should have a master's degree, and a Ph.D. is necessary for basic research and some management jobs in industry.

Employment, 1972	7,500
Projected 1985 requirements	9,500
Percent growth, 1972-85	29.7
Average annual openings, 1972-85	300
Growth	200
Replacements	100

Available training data:

Degrees in food science and technology:	
Bachelor's degrees	333
Master's degrees	188
Doctor's degrees	119

Physicists. New graduates with bachelor's degrees in physics are qualified for many applied research and development (R&D) jobs in private industry or the Federal Government. A master's degree qualifies applicants for many research jobs and teaching positions in colleges and universities. A doctor's degree usually is required for full faculty status at colleges and universities and to administer R&D programs.

College graduates with a major in physics are the major source of supply of new physicists. However, limited data on past patterns of entry into the occupation indicate that in the past a significant number of workers have entered physics from other sources such as immigration; college graduates with nonphysics majors; persons reentering the labor force; and persons entering from other occupations.[37] Although a variety of factors, including the availability of physics graduates, affect the number of other entrants, significant numbers probably will continue to enter the occupation. If past patterns of entry from these sources continue, only about 1,600 physics graduates would enter each year. Fewer than half of those who receive bachelor's degrees in physics actually enter the field. Therefore, if past trends continue, 3,400 physics graduates would be needed annually to meet projected requirements.

Projections of the U.S. Office of Education based on past trends of college studies show that, although the average annual number of bachelor's degrees in physics is declining, degrees will be 22 percent above the annual number required to meet projected needs.

Employment, 1972	49,000
Projected 1985 requirements	61,000
Percent growth, 1972-85	24.1
Average annual openings, 1972-85	2,800
Growth	900
Replacements	[1]1,900

Available training data:

	1970-71	*Projected 1972-85 (annual average)*
Bachelor's degrees	5,046	4,138
Master's degrees	2,714	1,932
Doctor's degrees	1,449	1,416

[1] Includes an estimated 1,300 replacements for those who transfer to other occupations.

Technician occupations

Broadcast technicians. Technicians must obtain a Radio-Telephone First Class Operator license from the Federal Communications Commission. To obtain the license, applicants must pass a series of written tests covering such subjects as the construction and operation of transmission and receiving equipment. Courses in mathematics, science, and electronics and special courses designed to prepare students for the FCC's license test are good preparation. Technical school or college training is an advantage for those wanting to advance to supervisory positions or to more specialized jobs in large stations and in the networks.

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[37] See footnote 31, p. 54.

Employment, 1972	23,000
Projected 1985 requirements	26,000
Percent growth, 1972-85	12.0
Average annual openings, 1972-85	700
Growth	200
Replacements	500
Available training data	–

Draftsmen. Post-high school training in technical institutes, junior and community colleges, extension divisions of universities, and vocational and technical high schools generally provides adequate training for beginning draftsmen. Necessary skills may also be obtained on the job combined with part-time schooling or through 3- or 4-year apprenticeship programs.

Employment, 1972	327,000
Projected 1985 requirements	485,000
Percent growth, 1972-85	48.0
Average annual openings, 1972-85	17,900
Growth	12,200
Replacements	5,700

Available training data:

MDTA:	
OJT enrollments	23
Institutional completions	146
Job Corps completions	72
Vocational education completions:	
Secondary	17,334
Postsecondary	6,006
Apprenticeship completions	453

Engineering and science technicians. Persons can qualify as engineering and science technicians through many combinations of education and work experience. Post-high school technical training may consist of 1 to 4 years of full-time study at a technical institute, junior and community college, extension division of a college and university, or vocational-technical high school. Training also may be acquired on the job or through courses taken part time in postsecondary schools or in correspondence schools. Some qualify through experience in technical jobs in the Armed Forces. Training for such occupations as tool designer and electronics technician is available through formal 2- to 4-year apprenticeship programs.

Employment, 1972	707,000
Projected 1985 requirements	1,050,000
Percent growth, 1972-85	48.9
Average annual openings, 1972-85	39,600
Growth	26,600
Replacements	13,000

Available training data:

MDTA:	
OJT enrollments	5
Institutional completions	18
Apprenticeship completions	400
Junior college graduates	38,420

Food processing technicians. Food processing technicians should have post-high school technical training. Formal training programs are offered in postsecondary schools such as technical institutes, junior and community colleges, and technical divisions of 4-year universities. Many 2-year schools require work experience in some phase of the industry between the first and second years. Persons also can qualify for jobs by completing on-the-job training programs, or through work experience and formal courses taken on a part-time basis. Dairy technicians must be licensed in most States.

Employment, 1972	4,500
Projected 1985 requirements	5,500
Percent growth, 1972-85	24.0
Average annual openings, 1972-85	200
Growth	100
Replacements	100

Available training data:

Junior college graduates	693

Surveyors. Persons can become surveyors by taking post-high school courses in surveying and having extensive on-the-job training. Programs in surveying at junior colleges, technical institutes, and vocational schools vary from 1 to 3 years. Many States require 4 to 5 years of experience in surveying and successful completion of an examination for licensing.

Employment, 1972	58,000
Projected 1985 requirements	81,000
Percent growth, 1972-85	40.0
Average annual openings	2,700
Growth	1,800
Replacements	900

Available training data:

Junior college graduates	1,637

Telephone craft occupations

Central office craft occupations. Trainee jobs are filled by employees already with the company such as telephone operators, and by workers from outside the company. While there are no formal educational requirements, a basic knowledge of electricity and electronics and/or telephone training in the Armed Forces are helpful. New workers receive classroom instruction and on-the-job training.

Employment, 1972	105,000
Projected 1985 requirements	119,000
Percent growth, 1972-85	11.3
Average annual openings, 1972-85	2,000
Growth	1,000
Replacements	1,000
Available training data	–

Central office equipment installers. Applicants usually must pass aptitude tests and a physical examination, but there are no educational requirements. New workers receive on-the-job training and classroom instruction.

Employment, 1972	30,000
Projected 1985 requirements	35,600
Percent growth, 1972-85	18.6
Average annual openings, 1972-85	1,200
Growth	500
Replacements	700
Available training data	–

Linemen and cable splicers. Companies hire inexperienced workers as trainees. While there are no formal education requirements, knowledge of the basic principles of electricity and/or telephone training in the Armed Forces are helpful Applicants usually must pass aptitude and physical exams. Telephone companies have training programs that include classroom instruction and on-the-job training.

Employment, 1972	50,000
Projected 1985 requirements	54,000
Percent growth, 1972-85	10.7
Average annual openings, 1972-85	700
Growth	300
Replacements	400
Available training data	–

Telephone servicemen. Applicants are selected from telephone company employees and inexperienced people from outside the company who have passed an aptitude test. Training includes both on-the-job and classroom instruction. There are no formal educational requirements.

Employment, 1972	108,000
Projected 1985 requirements	120,000
Percent growth, 1972-85	11.1
Average annual openings, 1972-85	2,000
Growth	900
Replacements	1,100
Available training data	–

Other mechanics and repairmen

Air-conditioning, refrigeration, and heating mechanics. Most air-conditioning, refrigeration, and heating mechanics start as helpers and learn their skills on the job. Employers prefer on-the-job trainees to be high school graduates who have had courses in mathematics, physics, and blueprint reading. Many high schools and vocational schools offer courses to prepare students for entry jobs.

Employment, 1972	135,000
Projected 1985 requirements	265,000
Percent growth, 1972-85	96.3
Average annual openings	13,100
Growth	10,000
Replacements	3,100
Available training data:	
MDTA:	
OJT enrollments	11
Institutional completions	1,187
Job Corps completions	230
Vocational educational completions:	
Secondary	4,475
Postsecondary	3,385

Appliance servicemen. Appliance servicemen usually are hired as helpers and acquire their skills on the job. Employees prefer applicants who are high school or trade school graduates. Servicemen need up to 3 years' experience to become fully qualified.

Employment, 1972	130,000
Projected 1985 requirements	175,000
Percent growth, 1972-85	35.0
Average annual openings	6,100
Growth	3,500
Replacements	2,600
Available training data:	
MDTA:	
OJT enrollments	14
Institutional completions	225
Job Corps completions	216

Vocational education completions:	
Secondary	1,973
Postsecondary	1,078

Automobile body repairmen. Generally, 3 to 4 years of on-the-job training are necessary to become fully qualified. Most training authorities recommend the completion of a 3- or 4-year apprenticeship program which includes on-the-job and related classroom instruction. Although high school graduation is not required for an entry job, most employers consider this an asset.

Employment, 1972	161,000
Projected 1985 requirements	187,000
Percent growth, 1972-85	16.1
Average annual openings, 1972-85	4,100
Growth	2,000
Replacements	2,100

Available training data:	
MDTA:	
OJT enrollments	63
Institutional completions	998
Job Corps completions	604
Vocational education completions:	
Secondary	9,037
Postsecondary	2,851
Apprenticeship completions	308

Automobile mechanics. Most automobile mechanics learn the trade through 3 to 4 years of on-the-job experience. Most training authorities recommend completion of a 3- or 4-year apprenticeship program as the best way to learn this trade. Work experience as a gasoline service station attendant, training in the Armed Forces, and courses offered at high schools, vocational schools, or private trade schools are helpful.

Employment, 1972	727,000
Projected 1985 requirements	860,000
Percent growth, 1972-85	18.4
Average annual openings, 1972-85	22,300
Growth	10,200
Replacements	12,100

Available training data:	
MDTA:	
OJT enrollments	140
Institutional completions	3,509
Job Corps completions	2,171
Vocational education completions:	
Secondary	44,135
Postsecondary	8,597
Apprenticeship completions	1,269

Boat motor mechanics. Generally, 2 to 3 years of on-the-job training are necessary to become skilled in repairing both outboard and inboard gasoline motors. Employers sometimes send trainees to factory-sponsored courses for 1 or 2 weeks to learn the fundamentals of motor repair. A high school diploma is preferred but not required.

Employment, 1972	10,300
Projected 1985 requirements	13,700
Percent growth, 1972-85	33.3
Average annual openings, 1972-85	500
Growth	300
Replacements	200

Available training data:	
MDTA:	
OJT enrollments	1
Institutional completions	43

Bowling-pin-machine mechanics. Mechanics learn their skills at schools maintained by bowling-machine manufacturers or on the job. To become a trainee at a factory school, candidates usually must be 16 years old and take written tests of mechanical ability and personality traits. After attending factory schools, trainees need several months of on-the-job experience. Employers prefer to hire persons who are high school graduates.

Employment, 1972	6,000
Projected 1985 requirements	6,600
Percent growth, 1972-85	10.8
Average annual openings, 1972-85	200
Growth	100
Replacements	100
Available training data	–

Business machine servicemen. Most business machine servicemen acquire their skills through on-the-job training and work experience following instruction in manufacturers' or dealers' training schools. Employers desire applicants who are at least high school graduates, and like to hire veterans who have had electronics training in the Armed Forces. A servicemen usually needs 1 to 3 years of practical experience and on-the-job training following a formal training program before he is considered fully qualified.

Employment, 1972	69,000
Projected 1985 requirements	97,000
Percent change, 1972-85	41.2
Average annual openings, 1972-85	3,000
Growth	2,100
Replacements	900

Available training data:	
MDTA:	
OJT enrollments	11

Institutional completions	149
Job Corps completions	98
Vocational education completions:	
Secondary	529
Postsecondary	462

Computer service technicians. Employers usually require applicants to have 1 to 2 years of post-high school training in basic electronics or electrical engineering from a computer school, a technical institute, a junior college, or a college. Electronics training in the Armed Forces is also excellent preparation for trainees.

Employment, 1972	45,000
Projected 1985 requirements	93,000
Percent growth, 1972-85	107.0
Average annual openings, 1972-85	4,100
Growth	3,700
Replacements	400
Available training data:	
Junior college completions	431

Diesel mechanics. Generally, mechanics need 3 to 4 years of on-the-job training or formal apprenticeship to become fully qualified. Employers prefer to hire high school graduates. Trade and technical school courses in diesel engine maintenance and experience in repairing gasoline engines are helpful.

Employment, 1972	92,000
Projected 1985 requirements	125,000
Percent growth, 1972-85	36.8
Average annual openings, 1972-85	4,500
Growth	2,600
Replacements	1,900
Available training data:	
MDTA:	
OJT enrollments	6
Institutional completions	176
Job Corps completions	45
Vocational education completions:	
Secondary	948
Postsecondary	1,875

Dispensing opticians and optical mechanics. Most trainees learn their skills on the job, but the preferred training method is a 3- to 4-year formal apprenticeship program. Institutional training, leading to an associate degree, is becoming more common, and some vocational schools offer a 9-month optical mechanic course.

Employment, 1972	30,000
Projected 1985 requirements	46,000
Percent growth, 1972-85	52.0
Average annual openings, 1972-85	2,000
Growth	1,000
Replacements	1,000
Available training data	–

Electric sign servicemen. Most electric sign servicemen are trained on the job; generally, 3 years of on-the-job training are required to become fully qualified. Some qualify through electricians' apprenticeship programs that last 3 to 5 years. Employers prefer to hire high school graduates. Many cities require servicemen to obtain a license by passing a comprehensive examination in electrical theory and its application.

Employment, 1972	8,000
Projected 1985 requirements	11,700
Percent growth, 1972-85	46.3
Average annual openings, 1972-85	500
Growth	300
Replacements	200
Available training data	–

Farm equipment mechanics. Most farm equipment mechanics begin as helpers and learn their skills on the job. Employers prefer high school graduates who have a farm background. Generally, at least 3 years of on-the-job training are necessary before a person can become a qualified mechanic. Some mechanics qualify by completing a 3- to 4-year apprenticeship program.

Employment, 1972	47,000
Projected 1985 requirements	52,000
Percent growth, 1972-85	10.6
Average annual openings, 1972-85	1,400
Growth	400
Replacements	1,000
Available training data:	
MDTA:	
OJT enrollments	1
Institutional completions	126
Job Corps completions	105

Industrial machinery repairmen. Most workers who become industrial machinery repairmen begin as helpers and acquire their skills through several years' experience on the job. Others learn their trade through 4-year formal apprenticeship programs consisting of on-the-job training and related classroom instruction.

Employment, 1972	430,000
Projected 1985 requirements	850,000
Percent growth, 1972-85	98.6
Average annual openings, 1972-85	44,000
Growth	32,700
Replacements	11,300
Available training data:	
MDTA:	

OJT enrollments	94
Institutional completions	577
Job Corps completions	228
Apprenticeship completions	1,846

Instrument repairmen. Instrument repairmen may learn their trade on the job or through formal apprenticeship programs. Apprenticeships generally last 4 years and combine classroom instruction with work experience. Some train for instrument repair work in technical institutes or junior colleges. These schools offer programs that usually last 2 years and emphasize basic engineering courses, science, and mathematics. Armed Forces technical schools also offer training. Trainees or apprentices generally must be high school graduates.

Employment, 1972	100,000
Projected 1985 requirements	140,000
Percent growth, 1972-85	38.5
Average annual openings, 1972-85	4,800
Growth	3,000
Replacements	1,800
Available training data	–

Jewelers. These workers generally learn the jewelry trade either by serving a 3- to 4-year formal apprenticeship or through informal on-the-job training while working for an experienced jeweler. A few trade schools offer courses in jewelry repair.

Employment, 1972	18,000
Projected 1985 requirements	19,000
Percent growth, 1972-85	4.0
Average annual openings, 1972-85	800
Growth	100
Replacements	700

Available training data:

MDTA:

OJT enrollments	5

Locksmiths. About 4 years of on-the-job training are needed to qualify as a locksmith. Additional training is needed to service electronic security systems. High school graduates are preferred but not required. Some cities require locksmiths to be licensed.

Employment, 1972	9,200
Projected 1985 requirements	12,600
Percent growth, 1972-85	36.4
Average annual openings, 1972-85	500
Growth	300
Replacements	200
Available training data	–

Maintenance electricians. A high school education usually is required for electrician jobs. The skills of the trade are learned on the job or through formal apprenticeship programs. Apprenticeships usually last 4 years and combine on-the-job training with classroom instruction in related technical subjects. It usually takes more than 4 years to learn the trade informally on the job. A growing number of cities and counties require electricians to pass a comprehensive examination and get a license.

Employment, 1972	260,000
Projected 1985 requirements	325,000
Percent growth, 1972-85	25.0
Average annual openings, 1972-85	9,800
Growth	5,000
Replacements	4,800

Available training data:

Apprenticeship completions	1,691

Motorcycle mechanics. Trainees generally learn the trade on the job in 2 to 3 years. Employers sometimes send mechanics and experienced trainees to special training courses conducted by motorcycle manufacturers and importers. Employers prefer high school graduates and also cycling enthusiasts who have gained experience by repairing their own motorcycles.

Employment, 1972	9,600
Projected 1985 requirements	19,000
Percent growth, 1972-85	97.9
Average annual openings, 1972-85	800
Growth	700
Replacements	100
Available training data	–

Piano and organ servicemen. Trainees generally learn the trade on the job. It usually takes 3 to 4 years of experience to become a qualified serviceman. Electronic organ technician applicants usually need formal training in electronics available from technical schools, junior colleges, and some technical-vocational high schools.

Employment, 1972	7,000
Projected 1985 requirements	7,000
Percent growth, 1972-85	0.0
Average annual openings, 1972-85	320
Growth	0
Replacements	320
Available training data	–

Shoe repairmen. Most shoe repairmen are hired as helpers and receive on-the-job training in large shoe repair shops. It usually takes about 2 years of experience to become fully qualified. Some shoe repairmen learn this trade in vocational schools and a few enter the occupation through apprenticeship training programs.

Employment, 1972	30,000
Projected 1985 requirements	26,000
Percent growth, 1972-85	13.3

Average annual openings, 1972-85	1,200
Growth	−300
Replacements	1,500

Available training data:

MDTA:

Institutional completions	5

Television and radio service technicians. Formal training in electronics—in technical, vocational, or high schools or in the military—combined with 2 to 4 years of on-the-job training is required to become a qualified technician. Those who have no previous training may be hired as helpers if they show aptitude for the work or have a hobby in electronics.

Employment, 1972	144,000
Projected 1985 requirements	170,000
Percent growth, 1972-85	18.1
Average annual openings, 1972-85	4,400
Growth	2,000
Replacements	2,400

Available training data:

MDTA:

OJT enrollments	16
Institutional completions	490
Job Corps completions	146

Truck mechanics and bus mechanics. Most truck or bus mechanics learn their skills on the job. Generally, 3 to 4 years' experience is necessary to qualify as an all-round mechanic. A formal 4-year apprenticeship is the recommended way to learn these trades. Typical apprenticeships consist of about 8,000 hours of shop training and 576 hours of related classroom instruction. For entry jobs, employers usually seek high school graduates who are at least 18. High school or vocational school courses in automobile repair and mathematics are useful. For some jobs that require driving, the mechanic must have a State chauffeur's license or meet qualifications for drivers established by the U.S. Department of Transportation.

Employment, 1972	130,000
Projected 1985 requirements	165,000
Percent growth, 1972-85	27.5
Average annual openings, 1972-85	5,100
Growth	2,800
Replacements	2,300
Available training data	–

Vending machine mechanics. Although not required, many beginning vending machine mechanics are high school graduates. High school or vocational school courses in electricity and machine repair are helpful. About 1-1/2 to 2 years of on-the-job training are needed to qualify as a skilled mechanic. On-the-job training is sometimes supplemented with manufacturer-sponsored training sessions. A commercial driver's license and a good driving record usually are required.

Employment, 1972	29,000
Projected 1985 requirements	39,000
Percent growth 1972-85	32.5
Average annual openings, 1972-85	1,500
Growth	800
Replacements	700

Available training data:

MDTA:

Institutional completions	12

Watch repairmen. Many persons prepare for this trade through courses given in private watch repair schools or public vocational high schools. Some are trained informally on the job or through formal apprenticeship. Although not required, students in most watch repair schools are high school graduates. A few States require watch repairmen to pass a qualifying examination and obtain a license.

Employment, 1972	16,000
Projected 1985 requirements	17,000
Percent growth, 1972-85	4.0
Average annual openings, 1972-85	700
Growth	100
Replacements	600
Available training data	–

Health Occupations

Dental occupations

Dentists. All States require dentists to have a license to practice. To qualify for a license, a candidate must graduate from an approved dental school and pass a State board examination. In 13 States a dentist cannot be licensed as a "specialist" without 2 or 3 years of graduate education and passing a special State examination. Dental colleges require from 2 to 3 years of predental college education. However, about three out of four students entering dental school have a bachelor's or master's degree. Dental school generally lasts 4 academic years although some schools condense this into 3 calendar years.

To meet projected needs between 1972 and 1985, the average annual number of dental school graduates will have to increase by about 25 percent over current levels. Federally assisted construction of additional training facilities has helped produce an increase in dental school enrollments in recent years. U.S. Public Health Service projections indicate that, as a result of this factor, the number of graduates is expected to approach the number needed.

Employment, 1972	105,000
Projected 1985 requirements	140,000
Percent growth, 1972-85	32.0
Average annual openings, 1972-85	5,300
Growth	2,600
Replacements	2,700

Available training data:

	1972	Projected 1972-85 (annual average)
D.D.S. or D.M.D. degrees	[1]3,930	5,139

[1] Calendar year.

Dental assistants. Most dental assistants learn their skills on the job. An increasing number, however, are trained in formal post-high school programs. Most of these programs, available in vocational and technical schools, last 1 year, and lead to a certificate or a diploma. Graduates of 2-year programs offered in junior and community colleges receive an associate degree after completing specialized training and liberal arts courses.

Employment, 1972	115,000
Projected 1985 requirements	155,000
Percent growth, 1972-85	35.0
Average annual openings, 1972-85	13,000
Growth	3,000
Replacements	10,000

Available training data:

Job Corps completions	73
Vocational education completions:	
Secondary	2,324
Postsecondary	3,343
Junior college graduates	2,191

Dental hygienists. Dental hygienists must be licensed and in all States, except Alabama, only graduates of accredited dental hygiene schools are eligible for licensing. To get a license they must pass both a written and a clinical examination. Most of the accredited school programs last 2 years and lead to a certificate or an associate degree. Some schools have 4-year bachelor's degree programs in dental hygiene and others offer both 2-year and 4-year programs. Generally the 2-year programs are sufficient for those who want to work in a private dental office. A bachelor's degree is usually required for research, teaching, and work in public or school health programs.

Employment, 1972	17,000
Projected 1985 requirements	50,000
Percent growth, 1972-85	191.0
Average annual openings, 1972-85	4,800
Growth	2,500
Replacements	2,300

Available training data:

Vocational education completions:	
Secondary	43
Postsecondary	1,602
Junior college graduates	2,506
Bachelor's degrees	531
Master's degrees	24

Medical practitioners

Chiropractors. Most States regulate the practice of chiropractic and grant licenses to chiropractors who meet certain educational requirements and pass a State board examination. The type of practice permitted and the educational requirements vary considerably from one State to another. Most States require graduation from a 4-year chiropractic course following high school. About three-quarters of the States also require 2 years of college work in addition to chiropractic training. Many States also demand that chiropractors pass a basic science examination.

To meet projected needs for chiropractors between 1972 and 1985, schools would have to provide an average of 1,000 graduates each year, about 60 percent above current levels. Enrollments and applications to chiropractic schools have increased dramatically in recent years, however, and if this expansion continues, supply is likely to be in line with projected requirements.

Employment, 1972	16,000
Projected 1985 requirements	19,500
Percent growth, 1972-85	20.9
Average annual openings, 1972-85	1,000
Growth	300
Replacements	700

Available training data:

Doctor of Chiropractic degrees	[1]623

[1] Academic year 1971-72 graduates reported by chiropractic schools.

Optometrists. All States require that optometrists be licensed. Applicants for a license must graduate from an accredited school of optometry and pass an examination given by the State in which they plan to practice. The Doctor of Optometry degree requires a minimum of 6 years of education after high school consisting of 4 years of optometry school preceded by at least 2 years of preoptometric study at an approved university, college, or junior college. In 1972, 12 optometric schools were accredited by the American Optometric Association.

To meet projected annual needs for optometrists, the annual number of graduates must increase by more than two-thirds above current levels. First-year classes in optometry schools have increased in size in recent years, however, and if this expansion is maintained the need for additional graduates would be in rough balance with requirements.

Employment, 1972	18,700
Projected 1985 requirements	23,300
Percent growth, 1972-85	24.7
Average annual openings, 1972-85	900
Growth	400
Replacements	500

Available training data:

Doctor of Optometry (O.D.) degrees	531

Physicians and osteopathic physicians. A license to practice medicine is required in all States. To qualify for a license it is necessary to graduate from an approved medical school or school of osteopathy, pass a State board examination, and in many States, serve a 1-year hospital internship. Most students who enter medical school or a school of osteopathy have earned a bachelor's degree, although many schools accept students with just 3 years of college. While some medical schools have 3-year curriculums, most medical schools and schools of osteopathy take 4 years to complete. Those who wish to become specialists must have 2 to 5 years of additional hospital training followed by 2 years of supervised practice in the specialty.

If, over the 1973-85 period, the influx of foreign medical graduates continues in line with past trends (about 5,000 net additions a year), medical schools will graduate 14,000 or nearly 50 percent more physicians than in 1971 to meet projected needs. The large gap between supply and requirements is beginning to narrow as a result of recent expansions in the size of first-year medical classes.

U.S. Public Health Service projections indicate that over the 1972-85 period the number of M.D. and D.O. degrees each year will closely approximate the number needed to meet requirements.

Employment, 1972	330,000
Projected 1985 requirements	485,000
Percent growth, 1972-85	47.2
Average annual openings, 1972-85	19,000
Growth	12,000
Replacements	7,000

Available training data:

	1970-71	*Projected 1972-85 (annual average)*
M.D. degrees	[1]8,974	[2]13,746
D.O. degrees	[3]475	

[1] American Medical Association.

[2] U.S. Public Health Service estimates (M.D. and D.O combined).

[3] American Osteopathic Association, 1971 data.

Podiatrists. All States require a license for the practice of podiatry. To qualify for a license it is necessary to graduate from an accredited 4-year program in a college of podiatric medicine and pass a State board examination. At least 2 years of college are required for admission, to any of the five colleges of podiatric medicine.

Employment, 1972	7,300
Projected 1985 requirements	8,400
Percent growth, 1972-85	15.0
Average annual openings, 1972-85	400
Growth	100
Replacements	300

Available training data:

Doctor of Podiatric Medicine (D.P.M.) or Doctor of Podiatry (D.P.) degrees	240

Veterinarians. A license is required to practice veterinary medicine in all States and the District of Columbia. To be licensed a candidate must earn the Doctor of Veterinary Medicine (D.V.M.), pass a State board examination, and in some States have some practical experience under supervision.

Minimum requirements for the D.V.M. degree are 2 years of preveterinary college work followed by 4 years of professional study in a college of veterinary medicine. Two schools now offer the D.V.M. curriculum in 3 calendar years; however, the programs run continuously, without summer recess.

To meet projected needs for veterinarians between 1972 and 1985, veterinary colleges will have to graduate an average of 1,400 students annually. Anticipated enrollments over the next 13 years indicate this number of graduates is likely to be reached.

Employment, 1972	26,000
Projected 1985 requirements	37,000
Percent growth, 1972-85	41.1
Average annual openings, 1972-85	1,400
Growth	800
Replacements	600

Available training data:

Doctor of Veterinary Medicine (D.V.M.)	1,252

Medical technician, technologist, and assistant occupations

Electrocardiograph (EKG) technicians. EKG technicians are generally trained on the job. Training, which may last as long as 3 months, is usually conducted by a senior EKG technician or a cardiologist. High school graduation is generally required for entry into the occupation.

Employment, 1972	10,000
Projected 1985 requirements	15,000
Percent growth, 1972-85	50.0
Average annual openings, 1972-85	900
Growth	400
Replacement	500

Available training data:

Job Corps completions	8
Junior college graduates	22

Electroencephalograph (EEG) technicians. Most EEG technicians are trained on the job by experienced EEG personnel. However, with advances in medical technology, electroencephalograph equipment has become increasingly more complex and requires technicians with more training. A few training programs lasting 6 months to 1 year are available in some colleges and medical schools.

Employment, 1972	3,500
Projected 1985 requirements	5,500
Percent growth, 1972-85	57.1
Average annual openings, 1972-85	400
Growth	200
Replacements	200

Available training data:

Junior college graduates	22

Medical laboratory workers. The minimum educational requirement for a beginning job as a medical technologist usually is 4 years of college including completion of a specialized training program in medical technology. Medical laboratory technicians generally have 1 year or more of post-high school training in a junior college or vocational school. Some are trained in the Armed Forces. Most medical laboratory assistants are trained on the job. In recent years, however, an increasing number have studied in 1-year training programs conducted by hospitals, junior colleges, and vocational schools.

Employment, 1972	165,000
Projected 1985 requirements	210,000
Percent growth, 1972-85	27.3
Average annual openings, 1972-85	13,000
Growth	3,000
Replacements	10,000

Available training data:

MDTA:

Institutional completions	22
Job Corps completions	17

Vocational education completions:

Secondary	1,973
Postsecondary	1,078
Junior college graduates	1,335
Bachelor's degrees	3,097
Master's degrees	45
Doctor's degrees	4

Medical record technicians and clerks. Most employers prefer to hire medical record technicians who have graduated from an accredited college or hospital-based program. These programs range from 10 months for a certificate to 2 years for an associate degree. High school graduates with basic secretarial skills can enter the medical record field as clerks. About one month of on-the-job training will prepare them for routine tasks.

Employment, 1972	47,000
Projected 1985 requirements	118,000
Percent growth, 1972-85	152.0
Average annual openings, 1972-85	10,500
Growth	5,500
Replacements	5,000

Available training data:

MDTA:

Institutional completions	343
Junior college graduates	374

Optometric assistants. Most optometric assistants are trained on the job. Training also can be acquired in 1-year academic courses or in 2-year courses leading to an associate degree. High school graduation or its equivalent, including knowledge of mathematics and office procedures, is preferred for both on-the-job and formal training.

Employment, 1972	11,000
Projected 1985 requirements	20,000
Percent growth, 1972-85	78.8
Average annual openings, 1972-85	1,700
Growth	700
Replacements	1,000

Available training data:

Junior college graduates	81

Radiologic technologists. The requirement for entry into this field is completion of a formal training program in X-ray technology. These programs, which usually take 24 months, are offered in hospitals, medical schools, colleges, community colleges, vocational schools, and the military services. A few schools conduct 3- or 4-year programs and some award a bachelor's degree in X-ray technology. High school graduation is required for admission to all programs.

Employment, 1972	55,000
Projected 1985 requirements	87,000
Percent growth, 1972-85	58.0
Average annual openings, 1972-85	6,500
Growth	2,500
Replacements	4,000

Available training data:

Job Corps completions	6
Vocational education completions:	
Secondary	86
Postsecondary	1,154
Junior college graduates	1,139
Bachelor's degrees	48
Master's degrees	32
Doctor's degrees	10

Respiratory therapists. Although a few therapists are trained on the job, formal training is now stressed. High school graduation is required for entry to the more than 100 institutions offering educational programs in respiratory therapy. Courses last from 18 months to 4 years and include both theory and clinical work. A bachelor's degree is awarded for completing the 4-year program.

Employment, 1972	17,000
Projected 1985 requirements	30,000
Percent growth, 1972-85	77.0
Average annual openings, 1972-85	2,000
Growth	1,000
Replacements	1,000

Available training data:

Job Corps completions	2
Vocational education completions:	
Secondary	221
Postsecondary	978
Junior college graduates	570

Nursing occupations

Registered nurses. A license is required to practice professional nursing in all States. Getting a license requires graduating from a school approved by the State board of nursing and passing the State board examination. All nursing schools require a high school diploma for entry. Their programs vary in length from 2 to 5 years. Nurses completing 2-year courses earn associate degrees; those in 3-year courses earn a diploma; and bachelor's degrees are awarded to graduates of 4- and 5-year courses. Education at the master's degree level and above is required for positions in research, consultation, teaching, and clinical specialization.

Employment, 1972	748,000
Projected 1985 requirements	1,050,000
Percent growth, 1972-85	40.0
Average annual openings, 1972-85	75,000
Growth	24,000
Replacements	51,000

Available training data:

MDTA:	
Associate degrees	[1]14,474
Diplomas	[1]22,334
Bachelor's degrees	[1]9,913
Master's degrees	1,530
Doctor's degrees	7
Institutional completions	237

[1] American Nurses Association, 1970-71 data.

Licensed practical nurses. All States regulate the preparation and licensing of practical nurses. To be licensed, students must complete an approved course in practical nursing and pass a licensing examination. Educational requirements for enrollment in State-approved training programs range from completion of eighth or ninth grade to high school graduation. The required course generally lasts 1 year, and is given in junior colleges, local hospitals, health agencies, and public schools.

Employment, 1972	425,000
Projected 1985 requirements	835,000
Percent growth, 1972-85	96.0
Average annual openings, 1972-85	70,000
Growth	30,000
Replacements	40,000

Available training data:

MDTA:	
OJT enrollments	5
Institutional completions	505
Job Corps completions	66
Vocational education completions:	
Secondary	4,388
Postsecondary	24,995
Junior college graduates	7,708

Nursing aides, orderlies, and attendants. Although some employers prefer high school graduates, many hire nongraduates. Training is usually acquired on the job, often in combination with classroom instruction.

Employment, 1972	900,000
Projected 1985 requirements	1,360,000
Percent growth, 1972-85	51.0
Average annual openings, 1972-85	100,000
Growth	36,000
Replacements	64,000

Available training data:

MDTA:

OJT enrollments	342
Institutional completions	1,253
Job Corps completions	2,471

Vocational education completions:

Secondary	12,643
Postsecondary	6,199

Therapy and rehabilitation occupations

Occupational therapists. A bachelor's degree in occupational therapy is required to enter this profession. Some schools, however, offer programs leading to a certificate or a master's degree in occupational therapy for students who have a bachelor's degree in another field. After graduation and a 6- to 9-month clinical practice period, they are eligible to take the American Occupational Therapy Association examination to become registered occupational therapists (OTR).

Employment, 1972	7,500
Projected 1985 requirements	15,000
Percent growth, 1972-85	100.0
Average annual openings, 1972-85	1,100
Growth	600
Replacements	500

Available training data:

Junior college graduates	243
Bachelor's and master's degrees	[1]937

[1] American Medical Association estimate for calendar year 1972.

Occupational therapy assistants. Most occupational therapy assistants are trained on-the-job in hospitals and other health care facilities. Some learn their skills in vocational, technical, and adult education programs. Other assistants graduate from 1- or 2-year junior college programs or have completed an approved military occupational therapy assistant program. Applicants for training programs must be high school graduates or the equivalent.

Employment, 1972	6,000
Projected 1985 requirements	15,500
Percent growth, 1972-85	160.9
Average annual openings, 1972-85	1,200
Growth	700
Replacements	500

Available training data:

Vocational education completions:

Secondary	19
Postsecondary	326

Physical therapists. All States require a license to practice physical therapy. Applicants for a license must have a bachelor's degree in physical therapy and pass a State board examination. For those with bachelor's degrees in other fields, 12- to 16-month certificate programs and 2-year master's degree programs are available. A graduate degree combined with clinical experience increases advancement opportunities, especially in teaching, research, and administration.

Employment, 1972	18,000
Projected 1985 requirements	32,000
Percent growth, 1972-85	76.3
Average annual openings, 1972-85	2,200
Growth	1,000
Replacements	1,200

Available training data:

Junior college graduates	239
Bachelor's degrees	1,252
Master's degrees	73

Physical therapist assistants and aides. Some States now license physical therapist assistants. Completion of an approved 2-year associate degree program is required for a license. Many of these States, however, also license experienced physical therapist assistants who learned their skills in vocational, technical, or adult education programs, or from on-the-job training before associate degree programs were available. Physical therapist aides qualify for their occupation through on-the-job training in hospitals and other health care facilities.

Employment, 1972	10,500
Projected 1985 requirements	25,000
Percent growth, 1972-85	141.7
Average annual openings, 1972-85	2,000
Growth	1,100
Replacements	900

Available training data:

Job Corps completions	24

Vocational education completions:

Secondary	128
Postsecondary	199

Speech pathologists and audiologists. Most States prefer and some require a master's degree or its equivalent in speech pathology or audiology for beginning jobs in public schools. A teacher's certificate often is required also and some States demand that workers dealing with handicapped children have special training. Speech pathologists and audiologists who supervise Federal programs, such as Medicare and Medicaid, need a master's degree.

Employment, 1972	27,000
Projected 1985 requirements	34,000
Percent growth, 1972-85	26.9
Average annual openings, 1972-85	2,200
Growth	600
Replacements	1,600

Available training data:

Bachelor's degrees	1,427
Master's degrees	823
Doctor's degrees	70

Other health occupations

Dietitians. A bachelor's degree, preferably with a major in foods and nutrition or institution management, usually available in departments of home economics, is the basic educational requirement for dietitians. To qualify for professional recognition, the American Dietetic Association recommends the completion after graduation of an approved dietetic intership, or 2 years of experience. Some new programs combine a bachelor's degree and internship in a 4-year program.

Employment, 1972	33,000
Projected 1985 requirements	44,000
Percent growth, 1972-85	32.0
Average annual openings, 1972-85	3,100
Growth	800
Replacements	2,300
Available training data	–

Hospital administrators. Educational requirements for hospital administrators vary. A master's degree in health and hospital administration is generally the minimum level of education accepted. However, some employers prefer formal training in social or behavioral sciences, industrial engineering, or business administration along with extensive experience in the health field. A few require their administrators to be physicians or registered nurses.

Employment, 1972	17,000
Projected 1985 requirements	26,600
Percent growth, 1972-85	56.4
Average annual openings, 1972-85	1,600
Growth	700
Replacements	900

Available training data:

Bachelor's degrees	60
Master's degrees	496
Doctor's degrees	14

Medical record administrators. A bachelor's degree in medical record administration is required for work in this occupation. One-year certificate programs are available, however, for those who already have a bachelor's degree in another field which includes required courses in liberal arts and biological sciences.

Employment, 1972	11,600
Projected 1985 requirements	18,400
Percent growth, 1972-85	59.0
Average annual openings, 1972-85	1,400
Growth	500
Replacements	900

Available training data:

Bachelor's degrees	148

Pharmacists. A license to practice pharmacy is required in all States. To obtain a license one must graduate from an accredited pharmacy college, pass a State board examination, and usually also have a specified amount of practical experience under the supervision of a registered pharmacist. At least 5 years of study beyond high school are required to graduate from one of the 73 accredited colleges of pharmacy and receive a Bachelor of Science degree. Most of these colleges provide 3 or 4 years of professional instruction and require all entrants to have completed their prepharmacy education in an accredited junior college, college, or university.

To meet annual projected needs for pharmacists between 1972 and 1985, the annual number of graduates must increase by more than two-thirds above current levels.

Employment, 1972	131,000
Projected 1985 requirements	163,000
Percent growth, 1972-85	24.5
Average annual openings, 1972-85	7,700
Growth	2,500
Replacements	5,200

Available training data:

Bachelor's degrees	4,549
Master's degrees	194
Doctor's degrees	94

Sanitarians. The minimum educational requirement for sanitarians is usually a bachelor's degree, preferably in environmental health, although a major in any environmental, life, or physical science generally is acceptable. A graduate degree in some aspect of public health is usually required for administrative, teaching, and research jobs. Laws in 35 States provided for the registration of sanitarians in 1972; in some States, registration is mandatory.

Employment, 1972	17,000
Projected 1985 requirements	30,000
Percent growth, 1972-85	76.8
Average annual openings, 1972-85	1,600
Growth	1,000
Replacements	600
Available training data	–

Social Scientists

Anthropologists. A Ph.D. degree is necessary to become a professional anthropologist. Temporary jobs and assistantships are often available in graduate schools for college graduates working on advanced degrees in anthropology. A master's degree, plus field experience, is sufficient for many beginning professional jobs but promotion to top positions is generally limited to those with a Ph.D. degree. Anthropologists in many colleges and most universities need a Ph.D. degree to get permanent teaching jobs.

Employment, 1972	3,600
Projected 1985 requirements	6,000
Percent change, 1972-85	66.4
Average annual openings, 1972-85	400
Growth	200
Replacements	200
Available training data:	
Bachelor's degrees	4,384
Master's degrees	766
Doctor's degrees	241

Economists. A bachelor's degree in economics is sufficient for many beginning research jobs in government and private industry. People employed in these jobs, however, usually are not regarded as professional economists. Graduate training is very important in this field. A master's degree generally is required to get a job as a college instructor and for more responsible research positions in government or private industry. A Ph.D. degree is required for a professorship in a high-ranking college or university and is an asset for good positions in government, business, or private research organizations.

Employment, 1972	36,000
Projected 1985 requirements	46,000
Percent change, 1972-85	29.5
Average annual openings, 1972-85	1,500
Growth	700
Replacements	800
Available training data:	
Bachelor's degrees	15,758
Master's degrees	1,995
Doctor's degrees	721

Geographers. The educational requirement for beginning positions in geography is usually a bachelor's degree with a major in the field. For research and teaching jobs, and for advancement, graduate training usually is required. A Ph.D. is preferred.

Employment, 1972	7,500
Projected 1985 requirements	9,200
Percent change, 1972-85	22.6
Average annual openings, 1972-85	450
Growth	150
Replacements	300
Available training data:	
Bachelor's degrees	4,155
Master's degrees	649
Doctor's degrees	164

Historians. Graduate education usually is necessary for employment as a historian. A master's degree is the minimum requirement for college instructors. In many colleges and universities, however, a Ph.D. degree is essential for high-level teaching, research, and administrative positions. Most historians in the Federal Government and in nonprofit organizations have Ph.D. degrees or their equivalent. Although a bachelor's degree with a major in history is sufficient training for some beginning jobs in government, people in such jobs are not regarded as professional historians.

Employment, 1972	24,000
Projected 1985 requirements	30,000
Percent growth, 1972-85	25.3
Average annual openings, 1972-85	1,500
Growth	500
Replacements	1,000
Available training data:	
Bachelor's degrees	44,663
Master's degrees	5,157
Doctor's degrees	991

Political scientists. Graduate training generally is required for employment as a political scientist. A Ph.D. is required for professors at colleges and universities and is helpful for advancement in nonacademic areas. Those with a master's degree qualify for various administrative and research jobs in government and in nonprofit research or civic organizations. Trainees in public relations, research, budget analysis, or personnel fields may have a bachelor's degree in political science.

Employment, 1972	10,000
Projected 1985 requirements	12,200
Percent growth, 1972-85	22.0
Average annual openings, 1972-85	500
Growth	200
Replacements	300

Available training data:

Bachelor's degrees	27,482
Master's degrees	2,318
Doctor's degrees	700

Sociologists. A master's degree in sociology is generally the minimum requirement for employment as a sociologist. A Ph.D. is essential for becoming a professor at most colleges and universities. It also commonly is needed for directors of major research projects, some administrative jobs, or for consultants. Outstanding graduate students often get teaching or research assistantships which provide both financial aid and valuable experience.

Employment, 1972	15,000
Projected 1985 requirements	23,000
Percent growth, 1972-85	53.1
Average annual openings, 1972-85	1,200
Growth	600
Replacements	600

Available training data:

Bachelor's degrees	33,263
Master's degrees	1,808
Doctor's degrees	574

Social Service Occupations

Counseling occupations

School counselors. Most States require school counselors to have counseling and teaching certificates. Depending on the State, graduate work and from 1 to 5 years of teaching experience usually are required for a counseling certificate. In the few States where teaching experience is not required, it is possible to major in a liberal arts undergraduate program. Most college students interested in becoming school counselors usually take the regular program of teacher education with additional courses in psychology and sociology.

Employment, 1972	43,000
Projected 1985 requirements	59,000
Percent growth, 1972-85	36.9
Average annual openings, 1972-85	2,900
Growth	1,200
Replacements	1,700
Available training data	—

Employment counselors. State employment service offices require employment counselors to have 30 hours of graduate courses in a counseling field. One year of counseling-related experience may be substituted for 15 graduate hours. For higher level jobs and work in private and community agencies, a master's degree in vocational counseling or in a related field such as psychology, personnel administration, or guidance education is preferred and sometimes required. All States require counselors in their public employment offices to meet State civil service requirements that include minimum education and experience standards.

Employment, 1972	8,500
Projected 1985 requirements	14,000
Percent growth, 1972-85	66.2
Average annual openings, 1972-85	800
Growth	400
Replacements	400
Available training data	—

Rehabilitation counselors. The minimum educational requirement for rehabilitation counselors is a bachelor's degree with courses in counseling, psychology, and related fields. Increasing emphasis is being placed, however, on a master's degree in vocational counseling or rehabilitation counseling or in related subjects such as psychology, education, and social work. Work experience in fields such as vocational counseling and placement, psychology, education, and social work is an asset in being hired as a rehabilitation counselor.

Employment, 1972	16,000
Projected 1985 requirements	26,000
Percent growth, 1972-85	59.8
Average annual openings, 1972-85	1,700
Growth	700
Replacements	1,000
Available training data	—

College career planning and placement counselors. A bachelor's degree is generally the minimum requirement for career planning and placement work and a master's degree is being increasingly stressed. An undergraduate major in a behavioral science such as psychology or sociology and courses in counseling, personnel administration, and related business administration subjects are preferred for entry in the field.

Employment, 1972	3,800
Projected 1985 requirements	5,000
Percent growth, 1972-85	32.5
Average annual openings, 1972-85	200
Growth	100
Replacements	100
Available training data	—

Clergymen

Protestant ministers. Educational requirements for entry into the Protestant ministry vary greatly. Some denominations have no formal educational requirements, and others ordain people having varying amounts and types of training in Bible colleges, Bible institutes, or liberal arts colleges. Many denominations require 3 years of study in a theological school or seminary following college graduation. In general each large denomination has its own seminary or school of theology that reflects its particular doctrine, interests, and needs.

Employment, 1972	325,000
Projected 1985 requirements	360,000
Percent growth, 1972-85	10.9
Average annual openings, 1972-85	13,000
Growth	2,700
Replacements	10,300

Available training data:[1]

Bachelor's degrees	3,744
First professional degrees	5,055
Master's degrees	2,710
Doctor's degrees	312

[1] Includes all degrees granted in theology. Data on those trained for specific denominations are not available.

Rabbis. Requirements vary but almost all seminaries require a bachelor's degree plus prior preparation in Jewish studies for admission. The Rabbinic course in a Jewish theological seminary generally takes 3 to 5 years. Some seminaries grant advanced academic degrees in fields such as Biblical or Talmudic studies.

Employment, 1972	5,800
Projected 1985 requirements	6,400
Percent growth, 1972-85	11.0
Average annual openings, 1972-85	300
Growth	100
Replacements	200

Available training data:

See Protestant ministers.

Roman Catholic priests. Preparation for the priesthood requires 8 years or more of study beyond high school. Study may begin in the first year of high school, at the college level, or in a theological seminary after college graduation. Diocesan (secular) and religious priests attend different major seminaries, where slight variations in the training reflect the differences in the type of work expected of them as priests.

Employment, 1972	58,500
Projected 1985 requirements	63,000
Percent growth, 1972-85	7.9
Average annual openings, 1972-85	2,200
Growth	400
Replacements	1,800

Available training data:

See Protestant ministers.

Other social service occupations

Home economists. A bachelor's degree in home economics is usually required although some do enter the field with degrees in other subjects. A master's or a doctor's degree is required for college teaching, for some research and supervisory positions, and some jobs in the nutrition field.

Employment, 1972	120,000
Projected 1985 requirements	140,000
Percent change, 1972-85	14.0
Average annual openings, 1972-85	9,200
Growth	1,300
Replacements	7,900

Available training data:

Bachelor's degrees	11,167
Master's degrees	1,452
Doctor's degrees	123

Psychologists. A master's degree in psychology is generally required for employment as a psychologist. A Ph.D. degree, considered to be the full professional level, is needed for many entrance positions and is becoming increasingly important for advancement. Psychologists who want to enter independent practice must meet certification or licensing requirements in most States.

Employment, 1972	57,000
Projected 1985 requirements	90,000
Percent growth, 1972-85	55.5
Average annual openings, 1972-85	4,300
Growth	2,400
Replacements	1,900

Available training data:

Bachelor's degrees	37,880
Master's degrees	4,431
Doctor's degrees	1,782

Recreation workers. A high school education is generally the minimum requirement for recreation leader and camp counselor jobs. However, an associate degree from a community or junior college is preferred for year-round employment. Activity specialists should have an associate or bachelor's degree in recreation or in one of the arts. Many who concentrate in subjects such as drama, art, or dance have graduate degrees. Generally, recreation directors must have a bachelor's degree with a major in recreation, social science, or physical education as well as part-time or seasonal experience.

Employment, 1972	55,000
Projected 1985 requirements	90,000
Percent growth, 1972-85	63.0
Average annual openings, 1972-85	5,500

Growth	2,700
Replacements	2,800

Available training data:

Degrees in park and recreation management:

Bachelor's degrees	1,621
Master's degrees	218
Doctor's degrees	2

Social service aides. Graduation from high school generally is not required for social service aide jobs. Employers do not always look for the most highly skilled applicants. A person's need for work, as well as his potential for upgrading his skills, are often considered.

Employment, 1972	100,000
Projected 1985 requirements	150,000
Percent growth, 1972-85	50.0
Average annual openings, 1972-85	10,000
Growth	4,000
Replacements	6,000

Available training data:

Junior college graduates	1,146

Social workers. A bachelor's degree, preferably in social welfare or social work, generally is the minimum educational requirement for beginning jobs in social work. A graduate degree is necessary for teaching and research positions.

Employment, 1972	185,000
Projected 1985 requirements	275,000
Percent growth, 1972-85	48.6
Average annual openings, 1972-85	17,500
Growth	7,000
Replacements	10,500

Available training data:

Bachelor's degrees	4,608
Master's degrees	6,019
Doctor's degrees	126

Art, Design, and Communications-Related Occupations

Design occupations

Architects. Architects must obtain a license to practice in every State and the District of Columbia. To qualify for a license, applicants must take a 2-day written examination. Architects must have a bachelor's degree in architecture and three years of experience working in an architect's office. Those with a master's degree need two years of experience. In most States, 12 years of practical experience as an architect may be substituted for formal training.

Based on past relationships between the number who graduate each year with degrees in architecture and those licensed as architects, approximately 5,500 graduates would be needed annually to meet projected requirements of 3,300 a year. In 1971, about 3,500 persons earned a bachelor's or first professional degree in architecture. Therefore, to meet requirements over the 1972-85 period, degrees granted will have to be about 57 percent above 1971 levels. U.S. Office of Education projections show that the average number of bachelor's degrees in architecture will be increasing, but will still be below the level required to meet projected needs.

Employment, 1972	37,000
Projected 1985 requirements	65,000
Percent growth, 1972-85	76.0
Average annual openings, 1972-85	3,300
Growth	2,200
Replacements	1,100

Available training data:

Bachelor's degrees	3,459
Master's degrees	625
Doctor's degrees	6

Commercial artists. Artistic ability and good taste are the most important qualifications for success in commercial art. However, these qualities must be developed by specialized training in the techniques of commercial and applied art. The course of study, which may include some academic work, generally takes 2 or 3 years, and a certificate is awarded on graduation. A growing number of art schools, particularly those in or connected with universities, require 4 years or more of study and confer a bachelor's degree. Limited training in commercial art also may be obtained through public vocational high schools and on-the-job experience but supplemental training is usually needed for advancement.

Employment, 1972	60,000
Projected 1985 requirements	76,000
Percent growth, 1972-85	26.7
Average annual openings, 1972-85	3,400
Growth	1,200
Replacements	2,200

Available training data:

MDTA:

OJT enrollments	4
Job Corps completions	44

Vocational education completions:

Secondary	2,841
Postsecondary	1,979

Displaymen (retail trade). Most displaymen learn their trade on the job in 2 or 3 years. Employers require high school graduates and some prefer applicants who have completed such college courses as interior decorating, fashion design, and art.

Employment, 1972	33,000
Projected 1985 requirements	38,000
Percent growth, 1972-85	16.4
Average annual openings, 1972-85	2,000
Growth	400
Replacements	1,600

Available training data:

Job Corps completions	2

Floral designers. Trainees are hired as helpers and learn on the job. Two years of work experience usually are required to become a fully qualified designer. Some designers take courses in floral arrangement in public or private schools or in junior colleges. These courses, however, are not considered a substitute for on-the-job training.

Employment, 1972	30,000
Projected 1985 requirements	43,000
Percent growth, 1972-85	44.7
Average annual openings, 1972-85	2,500
Growth	1,000
Replacements	1,500

Available training data:

MDTA:

OJT enrollments	2

Vocational education completions:

Secondary	766
Postsecondary	76

Industrial designers. Persons usually enter this field by completing an industrial design curriculum in an art school, an art department of a university, or a technical college. Entrants from other fields such as engineering, architecture, and fine arts may qualify as industrial designers if they have the appropriate experience and artistic talent.

Employment, 1972	10,000
Projected 1985 requirements	14,000
Percent growth, 1972-85	40.0
Average annual openings, 1972-85	400
Growth	100
Replacements	300
Available training data	—

Interior designers. Interior designers usually are required to complete either a 2- or 3-year course at a recognized art school or institute specializing in interior decorating and design or a college or university program leading to a degree in interior design and decoration. In most cases, 1 to 5 years of on-the-job training are also required.

Employment, 1972	18,000
Projected 1985 requirements	23,000
Percent growth, 1972-85	29.0
Average annual openings, 1972-85	1,000
Growth	400
Replacements	600

Available training data:

Bachelor's degrees	314
Master's degrees	6

Landscape architects. A bachelor's degree in landscape architecture that takes 4 to 5 years of study is the usual requirement for employment. About half of all States require a license which requires 6 to 8 years' experience as a landscape architect or a degree from an accredited school plus 2 to 4 years' experience.

Employment, 1972	12,000
Projected 1985 requirements	21,000
Percent growth, 1972-85	76.0
Average annual openings, 1972-85	1,100
Growth	700
Replacements	400

Available training data:

Bachelor's degrees	505
Master's degrees	107
Doctor's degrees	1

Photographers. There is no standard preparation for work in photography. Many persons work in a commercial studio for 2 or 3 years and receive on-the-job training. Others take a 4-year curriculum at a college or university leading to a bachelor's degree with a major in photography. A few institutions offer a 2-year curriculum. Some specialized photographic work, such as scientific or engineering research, requires some technical expertise.

Employment, 1972	77,000
Projected 1985 requirements	88,000
Percent growth, 1972-85	14.3
Average annual openings, 1972-85	2,750
Growth	850
Replacements	1,900

Available training data:

OJT enrollments	4
Bachelor's degrees	477
Master's degrees	57

Urban planners For some jobs, a bachelor's degree in urban planning or a related field is acceptable; for most others, however, the master's degree in urban planning is required.

Although recently the number of graduates has been rising, the current shortage of well-qualified planners is expected to continue over the next few years. Trends in the number of planning graduates should be watched carefully, however, since continued growth may create keen competition for the available jobs toward the end of the 1972-85 period.

Employment, 1972	12,000
Projected 1985 requirements	18,500
Percent growth, 1972-85	54.2
Average annual openings, 1972-85	800
Growth	500
Replacements	300

Available training data:

Bachelor's degrees	229
Master's degrees	810
Doctor's degrees	23

Communications-related occupations

Newspaper reporters. Most large newspapers will consider only applicants with a college education in journalism or liberal arts. However, some jobs are available for talented writers without college training on rural, small-town, or suburban papers. Graduate work is becoming increasingly important.

Employment, 1972	39,000
Projected 1985 requirements	50,000
Percent change, 1972-85	28.0
Average annual openings, 1972-85	2,600
Growth	900
Replacements	1,700

Available training data:

MDTA:

OJT enrollments	2

Degrees in journalism:

Bachelor's degrees	5,114
Master's degrees	853
Doctor's degrees	15

Radio and television announcers. Vocational school training in announcing or college courses in broadcasting or liberal arts provide an excellent background for an announcer. Most announcers start out in small stations where they may be required to obtain Federal Communications Commission Radiotelephone First Class Operator licenses to operate transmitters; more often announcers only operate a control board for which only a third class license is needed.

Employment, 1972	21,000
Projected 1985 requirements	24,500
Percent growth, 1972-85	21.4
Average annual openings, 1972-85	500
Growth	300
Replacements	200
Available training data	–

Technical writers. A bachelor's degree is generally required to begin work in technical writing. Technical writers can qualify with a degree in engineering or science and courses in writing or a degree in English or journalism and courses in scientific and technical subjects. Sometimes, experienced writers with less academic training but some knowledge of technical fields can qualify.

Employment, 1972	20,000
Projected 1985 requirements	26,000
Percent growth, 1972-85	29.9
Average annual openings, 1972-85	1,100
Growth	500
Replacements	600
Available training data	–

Appendix A. Methods and Assumptions for Projections of Manpower Requirements

The Bureau of Labor Statistics has developed projections that encompass a number of interrelated components and permit a comprehensive view of tomorrow's economy and its manpower needs. These projections cover labor force, hours of employment, output per man-hour, potential demand, gross national product or GNP, the composition of demand, output, and productivity for detailed industry groups and detailed occupations.[1] The methods and assumptions used to develop the projected 1985 manpower requirements presented in this bulletin are the same as those used in other Bureau of Labor Statistics studies of future occupational needs. These are briefly summarized in the following sections.

Projection methods

The first step in making industry and occupational projections is to use statistics developed by the Bureau of the Census of total population in the target year, and its composition by age, sex, and color. As a second step, the Bureau of Labor Statistics develops projections of the labor force by age, sex, and color on the basis of changing labor force participation rates for each of these groups. These changes reflect a variety of factors, including changing educational standards, retirement practices, and size of families.

Labor force projections are then translated into the level of gross national product (GNP) that can be produced by a fully employed labor force.[2] GNP is derived by subtracting unemployment from the labor force and multiplying the result by an estimate of output per worker in the target year of the projection. Allowances must be made for average growth in productivity and expected changes in hour of work.

The next step is to distribute this potential growth in real GNP among the major components of GNP: consumer expenditures, business investment, government expenditures–Federal, State, and local–and net foreign demand.

After calculating and distributing potential GNP growth among its major categories, projections are developed for each of the major demand categories, such as the amount spent by consumers for food, clothing, rent, automobiles, drugs, cosmetics, trips abroad, medical expenses, and other goods and services. For each of the major GNP demand categories, a different procedure is followed in allocating demand to the producing industry.

Once estimates are developed for the product or service to be purchased, the production load is allocated not only to the various industries which make the final product but also to the intermediate and basic industries which provide raw materials, components, transportation, electric power, and other goods and services required in making final products. For this purpose, the Department of Commerce has developed an input-output table for the economy of the United States. This table shows transactions among industries; effects of such transactions can be traced among industries.

Estimates of production in each industry are then translated into employment requirements by projecting changes in output per man-hour in each industry and dividing this figure into output. Changes in output per man-hour are developed through studies of productivity and technological trends in all industries. These studies provide inputs to assess such things as potential competition among products, potential employment and economic effects of new technologies and inventions, and the effect of technological change on the occupational structure of industries.

As an independent check and to develop more detailed industry employment projections than allowed for by input-output tables, a regression analysis is conducted relating production and employment in various industries to the levels of final demand and other key variables. Also, detailed in-depth studies are conducted for several industries which result in projections of requirements based on a regression analysis of a variety of economic variables. Results of the regression analysis and input-output model are evaluated along with detailed industry analyses to develop final industry employment projections.

Projections of industry manpower requirements are then translated into occupational requirements. This calculation is made through the use of occupational composition patterns for all industries in the United States, which are summarized in an industry-occupational matrix. This matrix, which is divided into 120 industry sectors, shows the composition of employment according to 160 occupations.[3] These patterns are applied to current employment and to projected requirements by industry to estimate current employment and future requirements by occupation. In making these projections, allowance is made for changing occupational structures based on studies of the way each industry has changed in the past and is likely to change in the future. To arrive at a total for the economy, future employment requirements for each occupation are aggregated across all industries.

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[1] A summary report of the Bureau's 1980 and 1985 projections with a more detailed statement on methodology will be published by the Bureau as *The Structure of the U.S. Economy in 1980 and 1985*, Bulletin 1831 (in process).

[2] A 4-percent unemployment rate was assumed in the BLS projections.

For many occupations, requirements are projected on the basis of relationships to certain independent variables rather than on proportional representation in each industry. For example, employment requirements for automobile mechanics are projected on the basis of the expected stock of motor vehicles and their maintenance requirements, and elementary school teachers on trends in pupil-teacher ratios applied to projected school attendance. Projections developed independently are meshed with other occupational data in the matrix.

After estimating the requirements of each occupation, projections are prepared of the number of workers who will be needed as replacements. These separations from the labor force resulting from all cuases including occupational transfers constitute a very significant portion of total annual training needs.

Tables of working life have been developed based on actuarial experience for deaths and general patterns of labor force participation of each age.[4] Withdrawals from the labor force can be projected for men and women separately in each occupation for which age and sex are known. The net effects of interoccupational transfers, however, are not known in any systematic fashion and can only be estimated in projecting manpower training needs. Some work to develop such estimates, however, is currently being conducted by the BLS using data collected in the 1970 Decennial Census.

Assumptions

The BLS projections to 1985 presented in this bulletin are based on the following general assumptions:

Fiscal and monetary and manpower training and educational programs will achieve a satisfactory balance between relatively low unemployment and relative price stability, permitting achievement of the long-term economic growth rate. The projections assume a 4 percent unemployment rate (of the civilian labor force) and a 3 percent annual increase in the implicit price deflator for gross national product.

The institutional framework of the American economy will not change radically.

Economic, social, technological, and scientific trends will continue, including values placed on work, education, income, and leisure.

Efforts to solve major domestic problems such as those of air and water pollution, solid waste disposal, urban congestion, inadequate industrial safety, and energy shortages may consume more productive resources but will not have more than a marginal effect on long-term growth.

Projected U.S. energy requirements will be roughly in line with those projected by the U.S. Department of the Interior in *U.S. Energy Through the Year 2000*, December 1972. This means major reliance on oil imports to close the energy supply-demand gap. During the last quarter of 1973, curtailment of oil supplies from the Mideast raised questions regarding use of imports to close the supply-demand energy gap over the next few years. It remains to be seen whether this restriction on oil imports will continue over the long run and what implications this may have for the long-term growth rate and structural changes in the economy resulting from the effort to develop domestic alternatives to oil imports.

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[3] See the Industry-Occupational Matrix, appendix C, in *Occupational Employment Patterns for 1960 and 1975*, Bulletin 1599 (Bureau of Labor Statistics, 1968). Work is underway that will allow for the matrix to be expanded to over 400 occupations and 200 industries.

[4] For detailed information see *Tomorrow's Manpower Needs*, Vol. II, Bulletin 1606 (Bureau of Labor Statistics, 1969).

Appendix B. Detailed Occupational Projections

This appendix presents employment estimates, projected requirements, and annual job openings in tabular form for 240 occupations, the most complete detail published by the Bureau of Labor Statistics. These data are classified into the 13 occupational clusters used to group occupations in the 1974-75 edition of the *Occupational Outlook Handbook*: Industrial production and related occupations, office occupations, service occupations, education and related occupations, sales occupations, construction occupations, occupations in transportation activities, scientific and technical occupations, mechanics and repairmen, health occupations, social scientists, social service occupations, and art, design, and communications related occupations. The descriptions of occupational training in chapter 4 are classified by the same 13 clusters as are the training data in appendix C. Within each of the 13 major occupational clusters, data are subclassified into related fields; nursing, clerical workers, counseling occupations, etc.

When applicable, table B-1 includes the program codes for related instructional programs for both vocational and higher education (Vocational Education Codes and Higher Education General Information Survey (HEGIS) Codes). This coding helps to bridge the gap between education and manpower data.

In the table, absolute figures are rounded and percentages are shown to one decimal place. Hence, totals and percentages calculated on the basis of unrounded figures do not always correspond exactly with rounded data in the table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Industrial production and related occupations:								
Foundry occupations:								
Patternmakers	17.2309		19,000	19,300	1.5	450	25	425
Molders	17.2301		56,000	57,000	1.5	1,100	100	1,000
Coremakers	17.2301		23,000	23,300	1.5	475	25	450
Machining occupations:								
All-round machinists	17.2302		320,000	400,000	24.8	13,100	6,100	7,000
Instrument makers (mechanical)	17.2302		5,000	6,000	20.0	200	100	100
Machine tool operators	17.2303		546,000	670,000	22.9	25,600	9,600	16,000
Setup men (machine tools)	17.2302		43,000	59,000	37.2	2,200	1,200	1,000
Tool and die makers	17.2307		172,000	183,000	6.4	4,200	800	3,400
Printing occupations	17.1900	5009						
Bookbinders and related workers	17.1906		32,000	38,000	17.3	550	450	100
Composing room occupations	17.1901		170,000	166,000	−2.3	4,300	−300	4,600
Electrotypers and stereotypers	17.1903		7,000	6,000	−14.8	100	−100	200
Lithographic occupations	17.1902		81,000	120,000	48.4	5,100	3,000	2,100
Photoengravers	17.1904		16,000	15,000	−9.2	200	−100	300
Printing pressmen and assistants	17.1902		142,000	183,000	28.6	6,100	3,200	2,900
Other industrial production and related occupations:								
Assemblers			1,017,000	1,100,000	7.2	40,500	5,500	35,000

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85 — Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Other industrial production and related occupations: — Continued								
Automobile painters	17.0301		25,000	29,000	16.1	800	300	500
Blacksmiths	17.2399		10,000	9,400	-6.4	350	-50	400
Boilermaking occupations	17.1099		33,000	39,000	18.6	1,300	500	800
Electroplaters	17.2399		17,000	21,000	24.0	900	300	600
Foremen	17.1700		1,400,000	1,700,000	21.6	58,000	24,000	34,000
Forge shop occupations	17.2399		63,000	66,000	4.1	1,300	200	1,100
Furniture upholsterers	17.3500		35,000	39,000	12.6	1,400	300	1,100
Inspectors	17.2400		725,000	940,000	29.7	44,700	16,600	28,100
Millwrights	17.1099		83,000	103,000	24.3	3,300	1,600	1,700
Motion picture projectionists			16,000	19,000	15.3	1,000	200	800
Photographic laboratory workers	17.0900	5007	38,000	52,000	36.4	2,700	1,000	1,700
Power truck operators	17.100302		300,000	370,000	22.2	9,100	5,100	4,000
Production painters			180,000	197,000	9.4	5,000	1,300	3,700
Stationary engineers	17.3200		178,000	178,000	0.0	4,600	0	4,600
Stationary firemen	17.3200		93,000	88,000	-5.0	2,100	-400	2,500
Waste water treatment plant operators	16.9902		20,000	31,000	54.0	1,200	800	400
Welders and flamecutters	17.2306		554,000	770,000	39.0	27,200	16,700	10,500
Office Occupations:								
Clerical occupations	14.00							
Bookkeeping workers	14.0102		1,584,000	1,900,000	19.5	118,000	24,000	94,000
Cashiers	14.0103		998,000	1,360,000	36.1	96,000	28,000	68,000
File clerks	14.0302		272,000	318,000	16.7	22,800	3,500	19,300
Hotel front office clerks	14.1100		49,000	69,000	41.2	4,800	1,600	3,200
Office machine operators	14.0104	5005	195,000	230,000	17.9	13,700	2,700	11,000
Postal clerks	14.0403		286,000	312,000	8.8	10,500	1,900	8,600
Receptionists	14.0406		436,000	650,000	50.0	55,100	16,800	38,300
Shipping and receiving clerks	14.0503		451,000	490,000	9.1	13,800	3,200	10,600
Statistical clerks	14.0303		299,000	375,000	25.8	23,000	6,000	17,000
Stock clerks	14.0504		511,000	750,000	46.2	34,800	18,200	16,600
Stenographers and secretaries	14.0700	5005	3,074,000	4,950,000	60.8	411,000	144,000	286,000
Typists	14.0900	5005	1,021,000	1,400,000	38.7	115,700	30,400	85,300
Computer and related occupations	14.0200							
Electronic computer operating personnel	14.0201 .0202 .020201	5102; 5104; 5105	480,000	531,000	10.6	27,000	4,000	23,000
Programmers	14.0203	0704; 5103	186,000	290,000	55.9	13,000	8,000	5,000
Systems analysts	14.0204	0705	103,000	185,000	79.6	8,300	6,300	2,000
Banking occupations:								
Bank clerks	04.0400		473,000	665,000	40.4	43,200	14,700	28,500
Bank officers	04.0400	0504; 5003	219,000	308,000	40.4	13,600	6,800	6,800

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85—Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Banking occupations:—Continued								
Tellers	14.0105		248,000	350,000	40.4	25,000	7,700	17,300
Insurance occupations	04.1300	0512						
Actuaries		1703	5,500	9,000	62.0	500	300	200
Claim adjusters	04.1300		128,000	152,000	19.0	5,800	1,900	3,900
Claim examiners	04.1300		31,000	28,500	−7.8	600	−200	800
Underwriters	04.1300		61,000	71,000	16.6	2,500	800	1,700
Administrative and related occupations:								
Accountants		0502, 5002	714,000	935,000	31.0	41,900	17,000	24,900
City managers		2102	2,500	3,700	54.0	150	100	50
Credit officials		5003	114,000	160,000	40.9	7,500	3,600	3,900
Hotel managers and assistants	04.1100	0508, 5010	110,000	160,000	41.2	7,500	3,600	3,900
Lawyers		1401	303,000	380,000	25.8	16,500	6,000	10,500
Personnel workers		0515	240,000	400,000	69.2	20,800	12,200	8,600
Public relations workers	04.0100		87,000	110,000	28.6	5,000	1,900	3,100
Service occupations:								
Cleaning and related occupations:								
Building custodians	17.1100		1,885,000	2,4[illegible]0,000	29.0	136,000	42,000	94,000
Exterminators			25,000	34,000	38.1	1,300	800	500
Hotel housekeepers and assistants	09.0205		17,000	24,000	41.2	1,700	600	1,100
Food service occupations	17.2900							
Bartenders			200,000	235,000	16.8	8,800	2,600	6,200
Cooks and chefs	17.3902		866,000	1,000,000	14.2	52,000	10,000	42,000
Meatcutters	17.2903		200,000	198,000	−1.4	4,400	−200	4,600
Waiters and waitresses	17.2904		1,124,000	1,300,000	16.6	86,000	14,000	72,000
Personal service occupations:								
Barbers	17.2601		157,000	147,000	−6.4	5,000	−800	5,800
Bellmen and bell captains	04.1100		16,000	18,000	13.0	600	200	400
Cosmetologists	17.2602		500,000	670,000	35.0	51,000	13,000	38,000
Funeral directors and embalmers	07.0909		45,000	45,000	0.0	1,300	0	1,300
Private household workers			1,437,000	1,000,000	−30.8	51,000	−35,000	86,000
Protective and related service occupations:								
Firefighters	17.2801		200,000	315,000	57.2	11,600	8,800	2,800
Guards and watchmen	17.2802		250,000	320,000	29.3	19,300	5,600	13,700
Police officers	17.2802	2105, 2209; 5505	370,000	490,000	32.3	14,300	9,300	5,000
State police officers	17.2802	2105; 2209; 5505	44,000	66,000	50.8	2,300	1,700	600
Health and regulatory inspectors (Government)	17.2899	5408	25,000	35,000	48.4	1,700	900	800
Construction inspectors (Government)	17.2899		23,000	30,000	30.3	1,500	500	1,000
Other service occupations:								
Mail carriers	14.0403		263,000	300,000	14.1	7,900	2,900	5,000
Telephone operators	14.0401		230,000	232,000	1.5	16,000	200	15,800

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85—Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Education and related occupations:								
Teaching occupations:								
Kindergarten and elementary school teachers		0802	1,274,000	1,590,000	24.9	105,000	24,000	81,000
Secondary school teachers		0803;	1,023,000	1,044,000	2.1	40,000	1,600	38,400
College and university teachers		0804 0805	525,000	630,000	20.4	24,000	8,200	15,800
Library occupations:								
Librarians		1601	120,000	162,000	35.0	11,200	3,200	8,000
Library technical assistants		5504	25,000					
Sales occupations	04.0000							
Automobile parts countermen	04.0300	0509; 5004	72,000	95,000	32.0	3,400	1,800	1,600
Automobile salesmen	04.0300	0509;	131,000	148,000	13.0	4,600	1,300	3,300
Automobile service advisors	04.0300	0509; 5004	21,000	28,000	32.6	900	500	400
Gasoline service station attendants	04.1600		435,000	545,000	25.2	15,400	8,400	7,000
Insurance agents and brokers	04.1300	0512; 5004	385,000	450,000	16.7	16,000	5,000	11,000
Manufacturers' salesworkers	04.1200	0509; 5004	423,000	545,000	28.9	20,000	9,000	11,000
Real estate salesworkers and brokers	04.1700	0511; 5004	349,000	434,000	25.4	25,000	7,000	18,000
Retail trade salesworkers	04.0800	0509; 5004	2,778,000	3,330,000	20.0	190,000	40,000	150,000
Routemen			190,000	200,000	4.7	3,700	799	3,000
Securities salesworkers	04.0400	0400; 5004	220,000	290,000	28.0	11,900	4,800	7,100
Wholesale trade saleworkers	04.0800	0509; 5004	688,000	860,000	28.0	31,000	13,000	18,000
Construction occupations:								
Asbestos and insulation workers	17.1099		30,000	40,000	33.3	1,200	800	400
Bricklayers	17.1004		180,000	225,000	25.0	6,600	3,500	3,100
Carpenters	17.1001		1,045,000	1,200,000	14.8	37,000	12,000	25,000
Cement masons	17.1099		75,000	110,000	46.7	4,100	2,700	1,400
Construction laborers	17.1099		876,000	1,000,000	14.2	24,500	9,500	15,000
Electricians (construction)	17.1002		240,000	325,000	35.4	11,100	6,500	4,600
Elevator constructors	17.1099		17,000	25,000	47.1	1,000	600	400
Floor covering installers	17.1099		75,000	100,000	33.3	3,200	1,900	1,300
Glaziers	17.1009		12,000	18,000	50.0	700	500	200
Lathers	17.1006		30,000	40.000	33.3	1,100	800	300
Operating engineers	17.100302		435,000	570,000	31.0	18,500	10,500	8,000
Painters and paperhangers	17.1005		420,000	460,000	9.5	14,700	3,100	11,600
Plasterers	17.1006		30,000	32,000	6.6	900	200	700
Plumbers and pipefitters	17.1007		400,000	500,000	25.0	16,300	7,700	8,600
Roofers	17.1010		80,000	110,000	37.5	3,400	2,300	1,100
Sheet-metal workers	17.2305		65,000	80,000	23.1	2,300	1,200	1,100
Structural, ornamental, and reinforcing ironworkers, riggers, and machine movers	17.1099		95,000	120,000	26.3	3,400	1,900	1,500
Occupations in transportation activities:								
Air transportation occupations	17.0400							
Air traffic controllers	17.0403		19,500	26,000	33.8	800	500	300
Aircraft mechanics	17.0401		123,000	190,000	53.0	7,000	5,000	2,000

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85 – Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Air transportation occupations: –Continued								
Airline dispatchers	17.0403		800	800	0.0	20	0	20
Flight attendants	04.1900		39,000	76,000	92.4	8,000	2,500	5,500
Flight engineers	17.0403		7,000	9,500	35.7	300	200	100
Ground radio operators and teletypists			5,700	5,000	–13.0	100	–100	200
Pilots and copilots	16.0601		54,000	78,000	43.8	1,000	1,500	500
Traffic agents and clerks			59,000	110,000	88.7	7,000	4,000	3,000
Merchant marine occupations:								
Merchant marine officers			15,000	14,000	–9.8	200	–100	300
Merchant seamen			42,000	35,000	–16.7	100	–500	600
Railroad occupations:								
Brakemen			73,000	64,000	–12.5	400	–700	1,100
Bridge and building workers			10,500	9.900	–5.6	200	–50	250
Clerks	14.0303		82,600	64,000	–22.5	2,700	–1,400	4,100
Conductors			38,000	33,999	–12.6	700	–300	1,000
Locomotive engineers			35,000	33,500	–4.8	1,000	–100	1,100
Locomotive firemen			14,900	9,000	–38.4	–300	–500	200
Shop trades			78,000	67,000	–14.2	900	–800	1,700
Signal department workers			11,200	9,500	–14.9	–100	–200	100
Station agents	14.1900		8,700	6,500	–25.2	100	–150	250
Telegraphers, telephoners, and towermen			11,200	7,500	–33.2	–200	–300	100
Track workers			54,000	47,000	–13.0	900	–300	1,200
Driving occupations:								
Intercity busdrivers	04.1900		25,000	24,500	–2.1	500	0	500
Local transit busdrivers	04.1900		68,000	71,500	5.0	1,600	300	1,300
Local truck drivers			1,600,000	1,800,000	17.6	46,000	21,000	25,000
Long-distance truck drivers			570,000	670,000	17.6	16,600	7,700	8,900
Parking attendants			33,000	38,999	14.0	1,600	400	1,200
Taxi drivers	04.1900		92,000	85,000	–7.6	1,600	–500	2,100
Scientific and technical occupations:								
Conservation occupations:								
Foresters		0114	22,000	28,000	26.0	900	500	400
Forestry aides and technicians	01.0601	5403	14,500	21,500	48.3	800	500	400
Range managers	01.0608	0117	4,000	4,500	12.5	150	50	100
Engineers		0900	1,100,000	1,500,000	41.5	53,000	34,000	18,900
Aerospace		0902	62,000	75,000	22.0	1,700	1,000	700
Agriculture		0903	12,000	15,000	29.1	500	300	200
Biomedical		0905	3,000	5,000	40.6	200	100	100
Ceramic		0916	10,000	14,000	41.7	500	300	200
Chemical		0906	47,000	59,000	25.4	1,500	900	600
Civil		0908	177,000	235,000	33.8	8,500	4,600	3,900
Electrical		0909	231,000	330,000	44.1	11,000	7,800	3,200
Industrial		0913	125,000	190,000	53.5	7,400	5,100	2,300
Mechanical		0910	209,000	280.000	33.5	8 900	5 400	3,500

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85—Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Engineers:—Continued								
Metallurgical		0914	10,000	14,000	41.7	500	300	200
Mining		0918	4,000	4,000	4.7	100		100
Environmental scientists:								
Geologists		1914	23,000	32,000	37.5	1,100	700	400
Geophysicists		1916	8,000	11,000	38.3	600	200	400
Meteorologists		1913	5,000	6,000	29.2	200	100	100
Oceanographers		1191	4,500	6,300	33.0	200	100	100
Life science occupations:								
Life scientists		0400	180,000	235,000	29.1	9,200	4,100	5,100
Mathematics occupations:								
Mathematicians		1701	76,000	107,000	40.8	4,200	2,400	1,800
Statisticians		1702	23,000	32,000	39.6	1,700	700	1,000
Physical scientists:								
Chemists		1905	134,000	184,000	38.0	6,800	3,900	2,900
Food scientists		0113	7,500	9,500	29.7	300	200	100
Physicists		1902	49,000	61,000	24.1	1,500	900	600
Technician occupations:								
Broadcast technicians			23,000	26,000	12.0	700	200	500
Draftsmen	17.13		327,000	485,000	48.0	17,900	12,100	5,700
Engineering and science technicians	16.01	5300; 5401; 5407	707,000	1,050,000	48.9	39,600	26,600	13,000
Food processing technicians		5404	4,500	5,500	24.0	200	100	100
Surveyors			58,000	81,000	40.0	2,700	1,800	900
Mechanics and repairmen:								
Telephone craft occupations:								
Central office craft occupations	17.1501		105,000	119,000	11.3	2,000	1,000	1,000
Central office equipment installers	17.1501		30,000	35,600	18.6	1,200	500	700
Linemen and cable splicers	17.1402		50,000	54,000	10.7	700	300	400
Telephone servicemen	17.1501		108,000	120,000	11.1	2,000	900	1,100
Other mechanics and repairmen:								
Air-conditioning, refrigeration, and heating mechanics	17.0100; 17.3000		135,000	265,000	96.3	13,100	10,000	3,100
Appliance servicemen	17.0200		130,000	175,000	35.0	6,100	3,500	2,600
Automobile body repairmen	17.0201		161,000	187,000	16.1	4,100	2,000	2,100
Automobile mechanics	17.0302		727,000	860,000	18.4	22,300	10,200	12,100
Boat motor mechanics	17.220		10,300	13,700	33.3	500	300	200
Bowling-pin-machine mechanics	17.1401		6,000	6,600	10.8	200	100	100
Business machine servicemen	17.0600		69,000	97,000	41.2	3,000	2,100	900
Computer service technicians	17.0600	5105	45,000	93,000	107.0	4,100	3,700	400
Diesel mechanics	17.1200		92,000	125,000	36.8	4,500	2,600	1,900
Dispensing opticians and optical mechanics	07.0601		30,000	46,000	52.0	2,000	1,000	1,000
Electric sign servicemen	17.1200		8,000	11,700	46.3	500	300	200

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85—Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Other mechanics and repairmen:—Continued								
Farm equipment mechanics	03.0300		47,000	52,000	10.6	1,400	400	1,000
Industrial machinery repairmen	17.100301		430,000	850,000	98.6	44,000	32,700	11,300
Instrument repairmen	17.2101		100,000	140,000	38.5	4,800	3,000	1,800
Jewelers			18,000	19,000	4.0	800	100	700
Locksmiths			9,200	12,600	36.4	500	300	200
Maintenance electricians			260,000	325,000	25.0	9,800	5,000	4,800
Motorcycle mechanics	17.3100		9,600	19,000	97.9	800	700	100
Piano and organ servicemen			7,000	7,000	0.0	320	0	320
Shoe repairmen	17.3402		30,000	26,000	−12.5	1,200	−300	1,500
Television and radio service technicians	17.1503		144,000	170,000	18.1	4,400	2,000	2,400
Truck mechanics and bus mechanics			130,000	165,000	27.5	5,100	2,800	2,300
Vending machine mechanics			29,000	39,000	32.5	1,500	800	700
Watch repairmen	17.2102		16,000	17,000	4.0	700	100	600
Health occupations:								
Dental occupations:								
Dentists		1204	105,000	140,000	32.0	5,300	2,600	2,700
Dental assistants	07.0101	5202	115,000	155,000	35.0	13,000	3,000	10,000
Dental hygienists	07.0102	5203	17,000	50,000	191.0	4,800	2,500	2,300
Dental laboratory technicians	07.0103	5204	32,000	43,000	34.8	2,000	900	1,100
Medical practitioners:								
Chiropractors		1221	16,000	19,500	20.9	1,000	300	700
Optometrists		1209	18,700	23,300	24.7	900	400	500
Physicians and osteopathic physicians		1206; 1210	330,000	485,000	47.2	19,000	12,000	7,000
Podiatrists		1216	7,300	8,400	15.0	400	100	300
Veterinarians		1218	26,000	37,000	41.1	1,400	800	600
Medical technician, technologist, and assistant occupations:								
Electrocardiograph technicians	07.0902	5217	10,000	15,000	50.0	900	400	500
Electroencephalograph technicians	07.0901	5217	3,500	5,500	57.1	400	200	200
Medical laboratory workers	07.0200 .0203 .0299	5205	165,000	210,000	27.3	13,000	3,000	10,000
Medical record technicians and clerks		5213	47,000	118,000	152.0	10,500	5,500	5,000
Optometric assistants	07.0603	5212	11,000	20,000	78.8	1,700	700	1,000
Radiologic technologists	07.0501	5207	55,000	87,000	58.0	6,500	2,500	4,000
Respiratory therapists	07.0903	5215	17,000	30,000	77.0	2,000	1,000	1,000
Nursing occupations:								
Registered nurses	07.0301 16.0305	5208	748,000	1,050,000	40.0	75,000	24,000	51,000
Licensed practical nurses	07.0302	5209	425,000	835,000	96.0	70,000	30,000	40,000
Nurses aides, orderlies, and attendants	07.0303		900,000	1,360,000	51.0	100,000	36,000	64,000
Therapy and rehabilitation occupations:								
Occupational therapists		1208; 5210	7,500	15,000	100.0	1,100	600	500
Occupational therapy assistants	07.0401	5210	6,000	15,500	160.9	1,200	700	500

See footnotes at end of table.

Table B-1. Estimated 1972 employment, projected 1985 requirements, and average annual openings, by occupation, 1972-85—Continued

Occupation	Vocational education code[1]	HEGIS code[2]	Estimated employment 1972	Projected requirements 1985	Percent change 1972-85	Annual average openings 1972-85		
						Total	Employment change	Replacement needs[3]
Therapy and rehabilitation occupations:—Continued								
Physical therapists		5219	18,000	32,000	76.3	2,200	1,000	1,200
Physical therapist assistants and aides	07.0402	5219	10,500	25,000	141.7	2,000	1,100	900
Speech pathologists and audiologists		1220	27,000	34,000	26.9	2,200	600	1,600
Other health occupations:								
Dietitians		1306	33,000	44,000	32.0	3,100	800	2,300
Hospital administrators		1211	17,000	26,600	56.4	1,600	700	900
Medical record administrators		1202	11,600	18,400	59.0	1,400	500	900
Pharmacists		1211	131,000	163,000	24.5	7,700	2,500	5,200
Sanitarians		0922	17,000	30,000	76.8	1,600	1,000	600
Social scientists:								
Anthropologists		2202; 2203	3,600	6,000	66.4	400	200	200
Economists		2204	36,000	46,000	29.9	1,500	700	800
Geographers		2206	7,500	9,200	22.6	450	150	300
Historians		2205	24,000	30,000	25.3	1,500	500	1,000
Political scientists		2207	10,000	12,200	22.0	500	200	300
Sociologists		2208	15,000	23,000	53.1	1,200	600	600
Social service occupations:								
Counseling occupations		0826						
School counselors			43,000	59,000	36.9	2,900	1,200	1,700
Employment counselors			8,500	14,000	66.2	800	400	400
Rehabilitation counselors			16,000	26,000	59.8	1,700	700	1,000
College career planning and placement counselors			3,800	5,000	32.5	200	100	100
Clergymen		2301						
Protestant ministers			325,000	360,000	10.9	13,000	2,700	10,300
Rabbis			5,800	6,400	11.0	300	100	200
Roman Catholic priests			58,500	63,000	7.9	2,200	400	1,800
Other social service occupations:								
Home economists		1301	120,000	140,000	14.0	9,200	1,300	7,900
Psychologists		2001	57,000	90,000	55.5	4,300	2,400	1,900
Recreation workers		2103; 5506	55,000	90,000	63.0	5,500	2,700	2,800
Social service aides		5506	100,000	150,000	50.0	10,000	4,000	6,000
Social workers		2104	185,000	275,000	48.6	17,500	7,000	10,500
Art, design, and communications-related occupations:								
Design occupations:								
Architects		0202	37,000	65,000	76.0	3,300	2,200	1,[illegible]00
Commercial artists	17.0700		60,000	76,000	26.7	3,400	1,200	2,200
Displaymen	17.0702		33,000	38,000	16.4	2,000	400	1,600
Floral designers	04.0500		30,000	43,000	44.7	2,500	1,000	1,500
Industrial designers	17.0703	0203	10,000	14,000	40.0	400	100	300
Interior designers	17.0701		18,000	23,000	29.0	1,000	400	600
Landscape architects		0204	12,000	21,000	76.0	1,100	700	400
Photographers		1101	77,000	88,000	14.3	2,750	850	1,900
Urban planners		0206	12,000	18,500	54.2	800	500	300
Communications related occupations:								
Newspaper reporters		0602	39,000	50,000	28.0	2,600	900	1,700
Radio and television announcers		0603	21,000	24,500	21.4	500	300	200
Technical writers			20,000	26,000	29.9	1,100	500	600

See footnotes at end of table.

[1] Vocational education codes are from *Vocational Education and Occupations* (U.S. Department of Health, Education and Welfare, and U.S. Department of Labor, 1969).

[2] HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Health, Education and Welfare, 1970).

[3] Replacement needs include openings arising from deaths, retirements, and other separations from the labor force. Does not include transfers to other occupations.

NOTE: Percentages were calculated from unrounded numbers and therefore may not agree with rounded numbers on employment and projected requirements shown in the table.

Appendix C. Detailed Training Statistics

This appendix presents tabulations of all available statistics on the numbers of persons completing training for occupations for which appendix B presents projections. Table C-1 presents statistics for occupations that require fewer than 4 years of college; tables C-2 and C-3 present data for occupations for which a college degree or graduate degree is required. These data are also presented in chapter 4 along with information on how workers are trained for specific occupations and projections of occupational requirements.

Tables C-4 and C-5 present limited trend data for junior college graduates and apprenticeship completions. Table C-6 presents Armed Forces manpower data by occupational specialty.

Data in table C-1 are not strictly comparable because different programs cover differing time periods (fiscal years, calendar years, and academic years) and because the data represent program enrollments in some cases and completions in others. Data on enrollments were used as a proxy for completions even though not all enrollees in a specific program complete their training. Table C-1 emphasizes the fragmentary and inconsistent nature of the data on occupational training and the need for improvement. Footnotes are used extensively to indicate data limitations.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973		Job Corps completions, FY 1972	Vocational education completions, FY 1972		Apprenticeship completions 1972
				On-the-job enrollments	Institutional completions		Secondary	Post-secondary	
Industrial production and related occupations:									
Foundry occupations:									
Patternmakers	17.2309								275
Molders	17.2301								
Coremakers	17.2301				1				
Machining occupations:									
All-round machinists	17.2302			215	78				3,695
Instrument makers	17.2302			20					
Machine tool operators	17.2303			840	1,833	137			
Setup men (machine tools)	17.2302			400	143				
Tool and die makers	17.2307			94	183				3,825
Printing occupations[1]	17.1900	5009	512				10,960	2,356	2,706
Bookbinders and related workers	17.1906					27			231
Composing room occupations	17.1901			34					844
Electrotypers and stereotypers	17.1903								
Lithographic occupations	17.1902				54				518
Photoengravers	17.1904				30				
Printing pressmen and assistants	17.1902			9	14	204			635
Other industrial production and related occupations:									
Assemblers				396	158	986			
Automobile painters	17.0301			1	30				
Blacksmiths	17.2399								
Boilermaking occupations	17.1099			58					594
Electroplaters	17.2399								
Foremen	17.1700						434	1,178	
Forge shop occupations	17.2399								
Furniture upholsterers	17.3500			15	144	142	[2]2,481	[2]256	

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973: On-the-job enrollments	MDTA training FY 1973: Institutional completions	Job Corps completions, FY 1972	Vocational education completions, FY 1972: Secondary	Vocational education completions, FY 1972: Post-secondary	Apprenticeship completions 1972
Other industrial production and related occupations:—Continued									
Millwrights	17.1099			58	8				1,080
Motion picture projectionist									
Photographic laboratory workers[3]	17.0900	5007	577		14		1,370	1,216	
Power truck operators	17.100302					19			
Production painters				5					
Stationary engineers	17.3200	—		22					
Stationary firemen	17.3200						70	55	
Waste water treatment plant operators	16.9902			509	37			234	
Welders and flamecutters	17.2306			349	6,442	1,916			
Office occupations:									
Clerical occupations	14.00						440,257	[4]88,916	
Bookkeeping workers	14.0102			160	63	24			
Cashiers	14.0103			37	97	113			
File clerks	14.0302			37	820	277			
Hotel front office clerks	14,1100			8					
Office machine operators	14,0104	5005		15	109	565			
Postal clerks	14.0403								
Receptionists	14.0406			19		37			
Shipping and receiving clerks	14.0503			23					
Statistical clerks	14.0303								
Stock clerks	14.0504			52	2,076	210			
Stenographers and secretaries	14.0700	5005	[5]16,534	305	1,720	146	107,368	24,328	
Typists	14.0900	5005		151	1,252	1,258	105,098	8,899	
Computer and related occupations	14.0200						23,444	13,274	
Electronic computer operating personnel	14.0201, .0202, .020201	5102, 5104, 5105	[6]6,165		158				
Programmers	14.0203	0704, 5103	2,149		3				
Banking occupations		0504, 5003	272			5			
Bank clerks	04.0400								
Tellers	14.0105			13	15				
Insurance occupations	04.1300	0512		1			364	132	
Claim adjusters	04.1300								
Claim examiners	04.1300								
Administrative and related occupations:									
Accountants		0502, 5002	5,301	1					
Motel managers and assistants	04.1100	0508, 5010	[7]916						
Purchasing agents	04.9900			2					

See footnotes on p. 94.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973: On-the-job enroll-ments	MDTA training FY 1973: Institu-tional comple-tions	Job Corps comple-tions, FY 1972	Vocational education completions, FY 1972: Secondary	Vocational education completions, FY 1972: Post-secondary	Appren-ticeship comple-tions 1972
Service occupations:									
Cleaning and related occupations:									
Building custodians	17.1100			208	500	1,089	1,951	522	
Exterminators				7	1				
Hotel housekeepers and assistants	09.0205						1,819	211	
Food service occupations	17.2900						7,480	1,899	
Bartenders									
Cooks and chefs	17.2902			[8]101	1,604	2,126			[8]229
Meatcutters	17.2903			7	67	151			997
Waiters and waitresses	17.2904			8	29	106			
Personal service occupations:									
Barbers	17.2601				26	7	304	581	
Bellmen and bell captains	04.1100				50				
Cosmetologists	17.2602			4	50	277	8,631	4,313	
Funeral directors and embalmers	07.0909								
Private household service occupations:									
Private household workers				21	17	6			
Protective and related service occupations:									
Firefighters	17.2801						55	1,032	
Guards and watchmen	17.2802			24					
Police officers[9]	17.2802	2105, 2209, 5505			202	1	788	7,478	
State police officers	17.2802	2105, 2209, 5505	6,873				788	7,478	
Health and regulatory inspectors (government)	17.2899	5408	145				600	557	
Construction inspectors (government)	17.2899						600	557	
Other service occupations:									
Mail carriers	14.0403								
Telephone operators	14.0401					7			
Education and related occupations:									
Library occupations:									
Library technical assistants		5504	471			5			
Sales occupations	04.0000			101			[10]114,040	[10]26,070	
Auto parts countermen					9				
Automobile salesmen	04.0300	5004	9,237				3,207	296	
Automobile service advisors	04.0300	5004	9,237				3,207	296	
Gasoline service station attendants	04.1600				4	145			
Insurance agents and brokers	04.1300	5004	9,237				364	132	
Manufacturers' salesworkers	04.1200	0509, 5004					828	1,031	

See footnotes on p. 94.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973		Job Corps completions, FY 1972	Vocational education completions, FY 1972		Apprenticeship completions 1972
				On-the-job enrollments	Institutional completions		Secondary	Post-secondary	
Sales occupations:—Continued									
Real estate salesworkers and brokers	04.1700	5004	9,237				713	4,265	
Retail trade salesworkers	04.0800	0509, 5014			7	175			
Routemen									
Wholesale trade salesworkers	04.0800	5004	9,237				43,271	6,463	
Construction occupations:									
Asbestos and insulation workers	17.1099			33					282
Bricklayers	17.1004			217	137	771			1,998
Carpenters	17.1001			1,532	446	2,266	13,608	2,364	5,054
Cement masons[1] [2]	17.1099			260		432			825
Construction laborers	17.1099				223	21			
Electricians (construction)[1] [3]	17.1002			33	404	523	1,951	1,750	5,991
Elevator constructors	17.1099								
Floor covering installers	17.1099			30	11				256
Glaziers	17.1009			8					335
Lathers	17.1006			2					276
Operating engineers	17.100302			388	70	1,146			1,035
Painters and paperhangers	17.1005			238	12	658			983
Plasterers	17.1006			17		75			245
Plumbers and pipefitters[1] [4]	17.1007				112	165	1,339	464	5,663
Roofers	17.1010			5					383
Sheet-metal workers	17.2305			15	113	211			2,768
Structural, ornamental, and reinforcing-ironworkers, riggers, and machine movers	17.1099			227	209				2,098
Occupations in transportation:									
Air transportation occupations	17.0400						3,800	2,767	
Air traffic controllers	17.0403								
Aircraft mechanics	17.0401								65
Airline dispatchers	17.0403								
Flight attendants	04.1900								
Flight engineers	17.0403								
Ground radio operators and teletypists									
Pilots and copilots	16.0601						76	836	
Traffic agents and clerks									
Merchant marine occupations:									
Merchant marine officers									
Merchant seamen					16				
Railroad occupations:									
Brakemen									
Bridge and building workers									
Clerks	14.0303								
Conductors									
Locomotive engineers									
Locomotive firemen									
Shop trades									
Signal department workers									
Station agents	14.1900								
Telegraphers, telephoners, and towermen									
Track workers									

See footnotes on p. 94.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973		Job Corps completions, FY 1972	Vocational education completions, FY 1972		Apprenticeship completions 1972
				On-the-job enrollments	Institutional completions		Secondary	Post-secondary	
Driving occupations:									
Intercity busdrivers	04.1900								
Local transit busdrivers	04.1900			64					
Local truck drivers				11	30	[15]14			
Long-distance truck drivers				42	290				
Parking attendants									
Taxi drivers	04.1900								
Scientific and technical occupations:									
Conservation occupations:									
Forestry aides and technicians	01.0601	5403	1,087		28	77			
Technician occupations:									
Broadcast technicians									
Draftsmen	17.13			23	146	72	17,334	6,006	453
Engineering and science technicians	16.01	5300, 5401, 5406, 5407	[16]38,420	5	18				[17]400
Food processing technicians		5404	693						
Surveyors		5309	1,637						
Mechanics and repairmen:									
Telephone craft occupations:									
Telephone craft workers	17.1402			42					
Central office craft occupations	17.1501								
Central office equipment installers	17.1501								
Linemen and cable splicers	17.1402								
Telephone servicemen	17.1501								
Other mechanics and repairmen:									
Air-conditioning, refrigeration, and heating mechanics	17.0100, 17.3000			11	1,187	230	4,475	3,385	
Appliance servicemen	17.0200			14	255	216	1,973	1,078	
Automobile body repairmen	17.0301			63	998	604	9,037	2,851	308
Automobile mechanics	17.0302			140	3,509	2,171	44,135	8,597	1,269
Boat motor mechanics	17.2200			1	43				
Bowling-pin-machine mechanics	17.1401								
Business machine servicemen[18]	17.0600			11	149	98	529	462	
Computer service technicians	17.0600	5105	431						
Diesel mechanics	17.1200			6	176	45	948	1,875	
Dispensing opticians and optical mechanics	07.0601								
Electric sign servicemen	17.1002								
Farm equipment mechanics	01.0300			1	126	105			

See footnotes on p. 94.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973		Job Corps completions, FY 1972	Vocational education completions, FY 1972		Apprenticeship completions 1972
				On-the-job enrollments	Institutional completions		Secondary	Post-secondary	
Other mechanics and repairmen:—Continued									
Industrial machinery repairmen	17.100301			94	577	228			1,846
Instrument repairmen	17.2101								
Jewelers and watch repairmen	17.2102			5					
Locksmiths									
Maintenance electricians							(19)	(19)	1,691
Motorcycle mechanics	17.3100								
Piano and organ servicemen									
Shoe repairmen	17.3402				5				
Television and radio service technicians	17.1503			16	490	146			
Truck and bus mechanics									
Vending machine mechanics					12				
Health occupations:									
Dental occupations:									
Dental assistants	07.0101	5202	2,191			73	2,324	3,343	
Dental hygienists	07.0102	5302	2,506				43	1,602	
Dental laboratory technicians	07.0103	5204	264	14			120	540	145
Medical technician, technologist, and assistant occupations:									
Electrocardiograph technicians	07.0902	5217	[20]22			8			
Electroencephalograph technicians	07.0901	5217	22						
Medical laboratory workers	07.0200, .0203, .0299	5205	1,335		22	17	1,973	1,078	
Medical record technicians		5213	374		343				
Optometric assistants	07.0603	5212	81						
Radiologic technologists	07.0501	5207	1,139			6	86	1,154	
Respiratory therapists	07.0903	5215	570			2	221	978	
Nursing occupations:									
Registered nurses[21]	07.0301 16.0305	5208	14,408		237				
Licensed practical nurses	07.0302	5209	7,708	5	505	66	4,388	24,995	
Nurses aides, orderlies, and attendants	07.0303			342	1,253	2,471	12,643	6,199	
Therapy and rehabilitation occupations:									
Occupational therapists		1208, 5210	243						
Occupational therapy assistants	07.0401	5210					19	326	
Physical therapist assistants and aides	07.0402	5219				24	128	199	
Medical record administrators		1202							

See footnotes on p. 94.

Table C-1. Known training in occupations which generally require less than a college degree for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	HEGIS code	Junior college graduates 1970-71	MDTA training FY 1973		Job Corps completions, FY 1972	Vocational education completions, FY 1972		Apprenticeship completions 1972
				On-the-job enrollments	Institutional completions		Secondary	Post-secondary	
Social service occupations:									
Social service aides		5506	1,146						
Art, design and communications—related occupations:									
Design occupations:									
Commercial artists	17.0700			4		44	2,841	1,979	
Displaymen	17.0702					2			
Floral designers	04.0500			2			[22]766	[22]76	
Industrial designers	17.0703	0203							
Interior designers	17.0701								
Photographers				4					
Communications—related occupations:									
Newspaper reporters		0602		2					
Radio and television announcers		0603							

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[1] Includes bookbinders, composing room occupations, lithographic occupations, pressmen, and miscellaneous printing occupations.

[2] Includes some upholsterers other than furniture.

[3] May include other photographic occupations.

[4] Includes training in occupations such as typists, bank tellers, office machine operators, bookkeeping workers, and computer operators. The number being trained for each occupation cannot be ascertained from the available data.

[5] Includes office machines training.

[6] Includes training for keypunch and other input technologies, computer operators and peripheral equipment operators, and general data processing workers.

[7] Includes restaurant management.

[8] Includes bakers.

[9] May include some State police.

[10] Includes all persons who completed distributive education programs.

[11] Includes some wholesale trade salesworkers.

[12] Includes stonemasons, marble-setters, and tile setters.

[13] All electricians, including maintenance.

[14] Includes sprinkler fitters.

[15] May include some over-the-road drivers.

[16] Includes an unknown number of workers trained for skilled craft occupations and technical related occupations such as industrial draftsmen.

[17] Electronics technician.

[18] May include some computer service technicians.

[19] See construction electricians.

[20] Includes EKG and EEG technicians.

[21] The total number of registered nurses trained in 1971 was 47,000. In addition to training sources shown, many were trained in hospital programs and some in 4-year college programs.

[22] Floral designers and salespersons.

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
All fields	839,730	230,509	32,107
Agriculture and natural resources	2,672	2,457	1,086
Agriculture, general	1,491	123	–
Agronomy	823	293	169
Soil science	212	87	89
Animal science	2,455	344	145
Dairy science	245	54	30
Poultry science	80	50	27
Fish, game, and wildlife management	936	151	43
Horticulture	385	161	76
Ornamental horticulture	200	10	2
Agricultural and farm management	213	–	–
Agricultural economics	1,175	417	212
Agricultural business	833	5	–
Food science and technology	333	188	119
Forestry	1,826	291	92
Natural resources management	424	76	16
Agriculture and forestry technologies	154	16	8
Range management	136	27	15
Other	711	164	43
Architecture and environmental design	5,570	1,705	36
Environmental design, general	568	58	2
Architecture	3,459	625	6
Interior design	314	6	–
Landscape architecture	505	107	1
Urban architecture	–	60	3
City, community, and regional planning	229	810	23
Other	495	39	1
Area studies	2,492	1,007	144
Asian studies, general	162	100	6
East Asian studies	42	87	8
South Asian (India, etc.) studies	26	18	3
Southeast Asian studies	10	8	
African studies	13	67	2
Islamic studies	3	–	1
Russian and Slavic studies	136	49	4
Latin American studies	280	148	3
Middle Eastern studies	4	8	–
European studies, general	51	–	–
Eastern European studies	20	–	–
West European studies	26	6	–
American studies	1,466	231	67
Pacific area studies	1	–	–
Other	252	285	50
Biological sciences	35,743	5,728	3,645
Biology, general	26,295	2,665	536
Botany, general	546	311	223
Bacteriology	353	74	42
Plant pathology	15	90	105
Plant physiology	7	28	37
Zoology, general	5,380	691	418
Pathology, human and animal	–	65	68
Pharmacology, human and animal	1	75	161
Physiology, human and animal	177	148	245
Microbiology	1,122	382	323
Anatomy	5	112	149
Histology	–	1	1
Biochemistry	568	251	517
Biophysics	53	39	101
Molecular biology	66	6	32

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
Biological sciences—Continued			
Cell biology	29	6	16
Marine biology	52	45	12
Biometrics and biostatistics	8	44	24
Ecology	96	21	17
Entomology	164	188	215
Genetics	46	88	128
Radiobiology	–	25	13
Nutrition, scientific	38	103	42
Neurosciences	22	2	8
Toxicology	–	9	5
Embryology	–	–	1
Other	701	259	206
Business and management	115,527	26,544	810
Business and commerce, general	30,187	8,693	190
Accounting	22,099	1,097	61
Business statistics	198	104	7
Banking and finance	5,922	1,781	23
Investments and securities	183	47	2
Business management and administration	28,028	9,571	306
Operations research	136	504	50
Hotel and restaurant management	616	18	
Marketing and purchasing	15,985	1,383	25
Transportation and public utilities	662	63	3
Real estate	420	40	3
Insurance	478	18	3
International business	220	245	6
Secretarial studies	1,323	–	–
Personnel management	1,205	296	3
Labor and industrial relations	1,148	300	25
Business economics	2,179	242	66
Other	4,538	2,142	37
Communications	10,802	1,856	145
Communications, general	1,734	518	93
Journalism	5,144	853	15
Radio/television	1,899	195	5
Advertising	1,194	94	–
Communication media	478	86	–
Other	353	110	32
Computer and information sciences	2,388	1,588	128
Computer and information sciences, general	1,624	1,131	110
Information sciences and systems	177	143	11
Data processing	409	171	–
Computer programming	32	5	–
Systems analysis	88	88	6
Other	58	50	1
Education	176,571	88,716	6,398
Education, general	2,026	12,867	1,598
Elementary education, general	90,432	17,070	219
Secondary education, general	3,549	5,422	212
Junior high school education	721	134	2
Higher education, general	6	308	274
Junior and community college education	1	91	6
Special education, general	2,320	3,051	114
Administration of special education	–	106	9
Education of the mentally retarded	2,640	935	18
Education of the gifted	12	28	–
Education of the deaf	239	208	4
Education of the culturally disadvantaged	3	115	–
Education of the visually handicapped	78	97	2
Speech correction	2,358	572	40

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
Education—Continued			
Education of the emotionally disturbed	347	378	14
Remedial education	—	87	—
Special learning disabilities	125	179	2
Education of the physically handicapped	149	150	—
Education of the multiply handicapped	63	50	—
Social foundations	180	534	129
Educational psychology	307	1,286	362
Pre-elementary education	3,405	533	9
Educational statistics and research	3	61	58
Educational testing, evaluation, and measurement	—	222	30
Student personnel	7	13,335	556
Educational administration	5	7,702	957
Educational supervision	—	707	71
Curriculum and instruction	296	2,261	458
Reading education	9	2,789	61
Art education	5,661	998	53
Music education	7,264	1,564	109
Mathematics education	2,217	782	49
Science education	891	883	91
Physical education	24,732	4,410	283
Driver and safety education	132	171	2
Health education	1,089	405	51
Business, commerce, and distributive education	8,550	1,924	82
Industrial arts, vocational and technical education	7,071	2,099	106
Agricultural education	1,398	447	43
Education of exceptional children, not classified above	26	112	4
Home economics education	6,449	802	28
Nursing education	603	330	28
Other	1,195	2,272	219
Home economics	11,167	1,452	123
Home economics, general	5,439	648	18
Home decoration and home equipment	376	31	1
Clothing and textiles	1,521	123	8
Consumer economics and home management	232	58	5
Family relations and child development	1,667	296	55
Foods and nutrition	981	231	33
Institutional management and cafeteria management	342	32	2
Other	609	33	1
Law			
Law, general	536	922	20
Other	9	33	—
Letters	73,122	12,710	2,416
English, general	51,562	7,510	1,008
Literature, English	4,541	885	274
Comparative literature	428	245	96
Classics	341	110	57
Linguistics	250	352	150
Speech, debate, and forensic science	6,970	1,715	235
Creative writing	154	185	6
Teaching of English as a foreign language	43	236	5
Philosophy	5,785	598	394
Religious studies	2,361	728	160
Other	687	146	31
Library science	1,013	7,001	39
Library science, general	978	6,959	35
Other	35	42	4

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
Mathematics	24,801	5,191	1,199
Mathematics, general	24,253	4,499	971
Statistics, mathematical and theoretical	214	495	185
Applied mathematics	248	132	43
Other	86	65	–
Military sciences	357	2	–
Military science (Army)	86	–	–
Naval science (Navy, Marines)	44	–	–
Aerospace science (Air Force)	22	2	–
Other	205	–	–
Physical sciences	21,412	6,367	4,390
Physical sciences, general	985	297	29
Physics, general	5,046	2,174	1,449
Molecular physics	3	–	–
Nuclear physics	22	14	33
Chemistry, general	11,037	2,197	1,952
Inorganic chemistry	14	5	26
Organic chemistry	9	26	58
Physical chemistry	1	14	46
Analytical chemistry	–	2	11
Pharmaceutical chemistry	2	31	66
Astronomy	102	100	76
Astrophysics	34	8	24
Atmospheric sciences and meteorology	249	153	61
Geology	2,359	606	289
Geochemistry	7	5	4
Geophysics and seismology	48	40	31
Earth sciences, general	667	262	25
Paleontology	3	9	7
Oceanography	228	152	52
Metallurgy	39	44	30
Other earth sciences	24	15	2
Other physical sciences	533	213	119
Psychology	37,880	4,431	1,782
Psychology, general	37,219	3,227	1,443
Experimental psychology	44	60	72
Clinical psychology	24	191	133
Psychology for counseling	21	499	20
Social psychology	78	37	51
Psychometrics	–	7	2
Industrial psychology	42	21	5
Developmental psychology	8	24	13
Physiological psychology	20	4	4
Other	424	361	39
Public affairs and services	9,220	8,260	178
Community services, general	233	72	2
Public administration	425	1,406	36
Parks and recreation management	1,621	218	2
Social work and helping services	4,608	6,019	126
Law enforcement and corrections	2,045	194	1
International public service	88	63	1
Other	200	288	10
Engineering	50,046	16,443	3,638
Engineering, general	2,864	813	219
Aerospace, aeronautical, astronautical engineering	2,443	717	217
Agricultural engineering	504	135	55
Architectural engineering	272	31	3
Bioengineering and biomedical engineering	68	73	29
Chemical engineering	3,579	1,100	406

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
Engineering—Continued			
Petroleum engineering	292	100	17
Civil, construction, and transportation engineering	6,526	2,425	446
Electrical, electronics, communications engineering	12,198	4,282	879
Mechanical engineering	8,858	2,237	438
Geological engineering	123	39	9
Geophysical engineering	26	7	1
Industrial and management engineering	3,171	1,921	139
Metallurgical engineering	623	273	148
Materials engineering	76	124	78
Ceramic engineering	178	39	25
Textile engineering	212	32	1
Mining and mineral engineering	158	66	43
Engineering physics	373	65	26
Nuclear engineering	250	329	120
Engineering mechanics	260	264	148
Environmental and sanitary engineering	54	238	49
Naval architecture and marine engineering	416	71	13
Ocean engineering	64	52	1
Engineering technologies	5,148	134	1
Other	1,310	876	127
Fine and applied arts	30,394	6,675	621
Fine arts, general	3,595	556	28
Art	10,688	1,690	6
Art history and appreciation	1,709	263	46
Music (performing, composition, theory)	3,318	1,713	200
Music (liberal arts program)	2,648	623	86
Music history and appreciation	96	99	40
Dramatic arts	3,675	1,039	122
Dance	197	78	1
Applied design	2,048	120	2
Cinematography	70	26	–
Photography	477	57	–
Other	1,773	411	90
Foreign languages	19,945	4,755	781
Foreign languages, general	607	444	122
French	7,306	1,437	192
German	2,601	690	144
Italian	201	87	10
Spanish	7,068	1,456	168
Russian	715	110	14
Chinese	89	22	8
Japanese	77	19	1
Latin	463	132	5
Greek, classical	104	21	18
Hebrew	203	19	4
Arabic	15	6	4
Indian (Asiatic)	1	–	3
Scandinavian languages	62	29	1
Slavic languages (other than Russian)	110	88	32
African languages (non-Semitic)	2	3	1
Other	321	192	54
Health professions	25,226	5,749	466
Health professions, general	230	46	12
Hospital and health care administration	60	496	34
Nursing	12,199	1,530	[illegible]
Dental specialties	5	450	34
Medical specialties	11	129	43
Occupational therapy	663	51	–

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1970-71—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
Health professions—Continued			
Optometry	351	12	2
Pharmacy	4,549	194	94
Physical therapy	1,252	73	–
Dental hygiene	531	24	–
Public health	127	1,244	85
Medical record librarianship	148	–	–
Podiatry or podiatric medicine	–	6	–
Biomedical communication	–	5	–
Veterinary medicine specialties	2	89	46
Speech pathology and audiology	1,427	823	70
Chiropractic	2	–	–
Clinical social work	36	304	7
Medical laboratory technologies	3,097	45	4
Dental technologies	62	–	–
Radiologic technologies	48	32	10
Other	426	196	58
Social sciences	155,326	16,501	3,659
Social sciences, general	21,543	2,330	50
Anthropology	4,384	766	241
Archaeology	72	29	8
Economics	15,758	1,995	721
History	44,663	5,157	991
Geography	4,156	649	154
Political science and government	27,482	2,318	700
Sociology	33,263	1,808	574
Criminology	659	136	15
International relations	1,212	783	66
Afro-American (Black culture) studies	80	17	–
American Indian cultural studies	2	1	–
Mexican-American cultural studies	8	7	–
Urban studies	371	236	–
Demography	5	6	8
Other	1,669	263	121
Theology	3,744	2,710	312
Theological professions, general	1,891	1,342	249
Religious music	116	106	6
Religious education	1,365	937	34
Other	348	307	23
Interdisciplinary studies	13,767	1,706	91
General liberal arts and sciences	5,461	549	11
Biological and physical sciences	3,897	524	15
Humanities and social sciences	2,020	336	21
Engineering and other disciplines	178	24	17
Other	2,211	273	27

SOURCE: Department of Health, Education, and Welfare, Office of Education.

Table C-3. First professional degrees[1] conferred by institutions of higher education, 1970-71

Field of study	First professional degrees
Total, all institutions	37,946
Dentistry (D.D.S. or D.M.D.)	3,745
Medicine (M.D.)	8,919
Optometry (O.D)	531
Osteopathy (D.O.)	472
Podiatry (Pod. D. or D.P.) or Podiatry Medicine (D.P.M.)	240
Veterinary Medicine (D.V.M.)	1,252
Law (LL.B. or J.D.)	17,421
Theology (B.D., M. Div., or Rabbi)	5,055
Other	311

[1] Includes degrees which require at least 6 years of college work for completion (including at least 2 years of preprofessional training).

SOURCE: U.S. Department of Health, Education, and Welfare, Office of Education, *Digest of Educational Statistics, 1972,* (OE) 73-11103.

Table C-4. Apprentice completions in selected trades, 1960-72

Trade	1960	1961	1962	1963	1964	1965	1966	1967[1]	1968[2]	1969[3]	1970	1971	1972
Construction trades[4]:													
Asbestos workers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	312	282
Brick, stone, and tile workers	2,110	1,566	1,527	1,484	1,369	1,342	1,346	1,602	1,206	1,651	1,801	1,431	1,998
Carpenters	2,567	2,886	2,986	3,013	2,882	3,272	3,340	4,249	3,423	3,698	3,083	3,639	5,054
Cement masons	405	406	327	312	222	297	293	372	386	300	273	384	825
Electricians	3,664	3,928	3,279	3,148	3,887	3,327	3,654	6,075	4,742	5,091	5,224	4,364	5,991
Glaziers	264	210	202	201	266	222	239	223	244	217	228	248	335
Leathers	339	412	387	216	240	268	198	466	290	145	202	188	276
Operating engineers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	439	1,035
Painters	654	765	790	895	770	969	807	1,019	868	829	832	992	983
Plasterers	367	228	290	338	267	181	215	264	291	228	161	161	245
Plumbers-pipefitters	2,780	3,372	3,409	2,924	3,101	3,050	2,736	3,601	3,788	4,888	4,266	4,880	5,255
Roofers	186	300	226	197	282	272	241	379	226	290	278	257	383
Sheet-metal workers	1,891	1,956	1,749	1,558	1,742	1,477	1,568	2,184	2,401	2,544	2,309	2,401	2,768
Sprinkler fitters	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	200	408
Structural iron workers	811	727	896	773	732	870	1,075	1,387	1,209	2,006	1,536	1,381	2,098
Construction workers not classified above	618	495	407	500	526	654	640	230	1,279	1,063	1,221	451	552
Metalworking trades:													
Boilermakers	59	91	59	59	52	111	91	199	135	180	364	405	504
Machinists	1,419	1,570	1,011	1,330	1,309	1,339	1,616	2,367	2,108	3,527	3,822	3,234	3,695
Patternmakers	445	260	195	150	131	160	150	326	350	395	444	290	275
Toolmakers, diemakers	1,830	1,690	1,339	1,367	1,489	1,293	1,704	3,596	2,502	4,125	4,748	3,482	3,825
Not classified above	398	393	294	333	290	350	558	1,239	902	822	1,032	446	531
Printing trades:													
Bookbinders	76	261	246	453	235	182	160	116	170	315	223	142	231
Compositors	658	966	869	730	666	675	559	807	810	837	774	623	844
Lithographers	268	281	223	458	538	264	380	403	250	785	906	320	518
Pressmen	409	580	611	598	[illegible]	304	423	517	721	826	637	354	635
Not classified above	264	438	337	280	277	140	170	230	173	214	360	285	478
Miscellaneous trades:[4]													
Aircraft mechanics	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	149	65
Automotive body builders-repairmen	182	183	154	117	135	133	151	218	214	211	595	307	308
Automotive mechanics	653	532	559	443	517	334	529	525	705	1,017	641	774	1,269
Butchers, meat cutters	516	355	401	350	369	448	531	631	756	362	727	817	997
Cabinetmakers - millmen	310	226	248	243	213	207	235	177	164	120	186	212	278
Carmen	69	33	20	42	13	24	9	77	140	82	101	138	128
Cooks (including bakers)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	261	229
Dental technicians	39	26	25	23	18	32	13	30	59	65	92	78	146
Draftsmen, designers	316	269	197	131	128	126	182	243	311	447	538	528	453
Electrical workers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,074	1,691
Electronic technicians	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	377	400
Floor coverers	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	316	256
Linemen, light and power	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	603	621	586
Maintenance mechanics (repairmen)	565	671	552	439	322	354	442	718	1,072	1,293	1,682	1,253	1,846
Millwrights	194	205	191	218	251	165	270	780	331	615	763	695	1,080
Not classified above	—	—	—	—	—	—	—	—	—	—	—	2,146	3,304

[1] Figures are understated because detailed data for Florida and Louisiana were not reported.

[2] Figures are understated because detailed data for Florida were not reported.

[3] Figures are understated because detailed data for California and Florida were not reported.

[4] It was not possible to provide a historical series for several trades because they were either recently listed as a separate trade (i.e., moved from a not elsewhere classified category), or were consolidated with one or more related occupations.

n.a. = not available.

SOURCE: U.S. Department of Labor, Bureau of Apprenticeship and Training.

Table C-5. Associate degrees and other formal awards below the baccalaureate, 1967-68 to 1970-71

HEGIS code[1]	Curriculum	Academic year			
		1967-68	1968-69	1969-70	1970-71
	All curriculums	88,082	108,088	124,327	153,549
5000	Business and commerce technologies	–	–	–	51,037
5001	Business and commerce technologies, general	10,156	12,591	14,666	11,008
5002	Accounting technologies	4,203	4,741	4,824	5,301
5003	Banking and finance technologies	–	–	–	272
5004	Marketing, distribution, purchasing, business, and industrial management	2,158	3,685	4,048	9,237
5005	Secretarial technologies (includes office machines training)	13,770	14,858	15,388	16,534
5006	Personal service technologies (flight attendant, cosmetologist, etc.)	–	–	–	1,262
5007	Photography technologies	–	–	–	577
5008	Communications and broadcasting technologies (radio/television, newspapers)	–	–	–	728
5009	Printing and lithography technologies	–	–	–	512
5010	Hotel and restaurant management technologies	–	–	–	916
5011	Transportation and public utility technologies	–	–	–	324
5012	Applied arts, graphic arts, and fine arts technologies (includes advertising design)	3,433	3,537	4,249	2,998
5099	Other	–	–	–	1,368
5100	Data processing technologies	2,908	4,623	6,487	8,745
5101	Data processing technologies, general	–	–	–	5,027
5102	Keypunch operator and other input preparation technologies	–	–	–	648
5103	Computer programmer technologies	–	–	–	2,149
5104	Computer operator and peripheral equipment operation	–	–	–	387
5105	Data processing equipment maintenance technologies	–	–	–	431
5199	Other	–	–	–	103
5200	Health services and paramedical technologies	16,903	21,876	26,778	34,518
5201	Health services assistant	–	–	–	258
5202	Dental assistant technologies	1,013	1,307	1,663	2,191
5203	Dental hygiene technologies	1,555	1,956	2,229	2,506
5204	Dental laboratory technologies	299	364	362	264
5205	Medical or biological laboratory assistant technologies	829	772	970	1,335
5206	Animal laboratory assistant technologies	–	–	–	55
5207	Radiologic technologies (X-ray, etc.)	587	570	647	1,139
5208	Nursing, practical (L.P.N. or L.V.N.–less than 4-year program)	4,380	5,564	6,102	7,708
5210	Occupational therapy technologies	52	154	166	243
5211	Surgical technologies	7	53	133	244
5212	Optical technologies (includes ocular care, ophthalmic, optometric technologies)	–	29	60	81
5213	Medical record technologies	–	–	–	374
5214	Medical assistant and medical office assistant technologies	–	–	–	1,256
5215	Inhalation therapy technologies	–	–	–	570
5216	Psychiatric technologies (includes mental health aide programs)	–	–	–	634
5217	Electrodiagnostic technologies (includes EKG, EEG, etc.)	–	11	23	22
5218	Institutional management technologies (rest home, etc.)	–	–	–	176
5219	Physical therapy technologies	–	–	–	239
5299	Other	–	–	–	815
5300	Mechanical and engineering technologies	22,686	26,736	28,959	37,437
5301	Mechanical and engineering technologies, general	–	–	–	2,560
5302	Aeronautical and aviation technologies	1,400	1,528	1,672	2,173
5303	Engineering graphics (tool and machine drafting and design)	–	–	–	2,917
5304	Architectural drafting technologies	–	–	–	1,938
5305	Chemical technologies (includes plastics)	426	513	556	589
5306	Automotive technologies	–	–	–	4,041
5307	Diesel technologies	–	–	–	721

See footnotes at end of table.

Table C-5. Associate degrees and other formal awards below the baccalaureate, 1967-68 to 1970-71 — Continued

HEGIS code[1]	Curriculum	Academic year			
		1967-68	1968-69	1969-70	1970-71
	Mechanical and engineering technologies—Continued				
5308	Welding technologies	–	–	–	1,097
5309	Civil technologies (surveying, photogrammetry, etc.)	1,103	1,391	1,537	1,637
5310	Electronics and machine technologies (television, appliance, office machine repair, etc.)	–	–	–	7,851
5311	Electromechanical technologies	–	–	–	1,301
5312	Industrial technologies	1,121	1,653	1,755	1,657
5313	Textile technologies	–	–	–	155
5314	Instrumentation technologies	120	180	207	203
5315	Mechanical technologies	3,745	8,069	9,391	2,749
5316	Nuclear technologies	14	17	38	65
5317	Construction and building technologies (carpentry, electric work, plumbing, sheet-metal, air conditioning, heating, etc.)	–	–	–	4,229
5399	Other	–	–	–	1,554
5400	Natural science technologies	–	–	–	7,028
5401	Natural science technologies, general	–	–	–	656
5402	Agriculture technologies (includes horticulture)	1,648	2,282	2,596	2,870
5403	Forestry and wildlife technologies (includes fisheries)	564	596	727	1,087
5404	Food services technologies	–	–	–	693
5405	Home economics technologies	723	776	841	872
5406	Marine and oceanographic technologies	–	–	–	183
5407	Laboratory technologies, general	–	–	–	144
5408	Sanitation and public health inspection technologies (environmental health technologies)	–	–	–	145
5499	Other	–	–	–	378
5500	Public-service-related technologies	–	–	–	14,784
5501	Public service technologies, general	–	–	–	277
5502	Bible study or religion-related occupations	762	690	642	744
5503	Education technologies (teacher aide and 2-year teacher training programs)	1,998	2,694	3,218	3,856
5504	Library assistant technologies	107	134	313	471
5505	Police, law enforcement, corrections technologies	1,840	2,851	4,084	6,873
5506	Recreation and social work and related technologies	–	–	–	1,146
5507	Fire control technology	–	–	–	735
5508	Public administration and management technologies	–	–	–	111
5509	Other	–	–	–	571

[1] HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Health, Education, and Welfare, 1970).

SOURCE: U.S. Department of Health Education, and Welfare Office of Education.

NOTE: Dash means data are not available or there were no programs.

Table C-6. Enlisted strength in Department of Defense occupational groups, December 31, 1972

DOD code	Group title and description of coverage	Enlisted strength
0	INFANTRY, GUN CREWS, AND SEAMANSHIP SPECIALISTS	236,877
01	*Infantry*—Includes light and heavy weapons infantrymen, related weapons specialists, ground reconnaissance men, and infantry leaders.	109,164
02	*Armor and Amphibious*—Includes land and amphibious tank crews and leaders.	17,832
03	*Combat Engineering*—Includes hasty and temporary construction of forward area airfields, roads, and bridges, demolition, field illumination, and chemical warfare.	18,896
04	*Artillery/Gunnery, Rockets, and Missiles*—Includes conventional field, anti-aircraft and shipboard guns and artillery, rockets, and missiles.	49,168
05	*Combat Air Crew*—Includes enlisted pilots and navigators, flight engineers, and flight crew ordnancemen	3,839
06	*Seamanship*—Includes boatswains, navigators, and similar seamanship specialists.	37,978
1	ELECTRONIC EQUIPMENT REPAIRMEN	200,495
10	*Radio/Radar*—Includes fixed and mobile radio, electronic communication gear, navigation and countermeasure equipment and surveillance, air traffic and tracking radar.	100,030
11	*Fire Control Electronic Systems (Non-Missile)*—Includes maintenance and repair of electronic fire control and bomb navigation equipment, excluding missile and underwater fire control equipment.	16,361
12	*Missile Guidance, Control, and Checkout*—Includes electronic and electrical missile and torpedo systems and components, including guidance, control, and checkout equipment for both guided and ballistic missiles.	23,782
13	*Sonar Equipment*—Includes underwater detection and fire control systems, oceanographic and mine detection equipment, and related antisubmarine electronic gear.	6,610
14	*Nuclear Weapons Equipment*—Includes nuclear weapons control and test equipment.	1,974
15	*ADP Computers*—Includes all digital and analog computers.	8,653
16	*Teletype and Cryptographic Equipment*—Includes teletype and associated on-and-off line encryption devices.	19,511
19	*Other Electronic Equipment*—Includes electronic instruments, training devices, medical equipment, television, electronic photographic controls, infra-red devices, and other electronic sensing and control equipment.	23,574
2	COMMUNICATIONS AND INTELLIGENCE SPECIALISTS	136,760
20	*Radio and Radio Code*—Includes the operation of radio, "continuous wave" equipment, radio teletype, and visual communication equipment.	47,930
21	*Sonar*—Includes the operation of sonar and related detection equipment.	3,842
22	*Radar and Air Traffic Control*—Includes the operation of surveillance, target acquisition and tracking radars, fire distribution devices, and air traffic control visual and electronic navigational aides.	30,261
23	*Signal Intelligence/Electronic Warfare*—Includes the intercept, translation, and analysis of foreign communications, and electronic countermeasure equipment operation.	24,104
24	*Military Intelligence*—Includes gathering, receipt, and analysis of intelligence data, prisoner interrogation, image interpretation, and counterintelligence and investigational activities.	14,394
25	*Combat Operations Control*—Includes forward area tactical operations and intelligence, combat information center and command post control activities.	16,229
3	MEDICAL AND DENTAL SPECIALISTS	86,472
30	*Medical Care*—Includes all medical care and treatment, technical and related medical and dental services.	60,033

Table C-6. Enlisted strength in Department of Defense occupational groups, December 31, 1972—Continued

DOD code	Group title and description of coverage	Enlisted strength
	MEDICAL AND DENTAL SPECIALISTS—Continued	
31	*Technical Medical Services*—Includes pharmaceutical, laboratory, X-ray, and diagnostic test services. . . .	11,465
32	*Related Medical Services*—Includes sanitation, health preservation and veterinary services, and preventive medicine services. . . .	5,100
33	*Dental Care*—Includes dental care and treatment and related technical and laboratory services. . . .	9,874
4	OTHER TECHNICAL AND ALLIED SPECIALISTS	36,573
40	*Photography*—Includes still, motion, and television cameramen, precision photographic processing, editing, and sound synchronization. . . .	9,343
41	*Drafting, Surveying, and Mapping*—Includes drafting, illustrating, photomapping, map compiling and construction, and topographic surveying and computing. . . .	8,967
42	*Weather*—Includes the observation, recording, reporting, and collection of weather and sea condition data and weather forecasting. . . .	7,040
43	*Ordnance Disposal and Diving*—Includes the excavation and rendering safe of explosive ordnance, chemical and nuclear agents, underwater demolition, and diving. . . .	2,579
44	*Scientific and Engineering Aides*—Includes professional college-graduate level assistance to physical and biological scientists and engineers. . . .	1,555
45	*Musicians*—Includes military bandsmen and special band musicians. . . .	4,533
49	*Technical Specialists, N.E.C.*—Includes physical laboratory analysts, nuclear, biological, and chemical warfare specialists, safety specialists, and memorial activities. . . .	2,556
5	ADMINISTRATIVE SPECIALISTS AND CLERKS	360,701
50	*Personnel*—Includes personnel administration, personnel and manpower management, recruiting and personnel testing. . . .	43,627
51	*Administration*—Includes administrative personnel, general clerks, not elsewhere classified. . . .	133,335
52	*Clerical Personnel*—Includes non-technical First Sergeants and Sergeant Majors and a combined personnel management and administrative clerk in Marine Corps units. . . .	9,798
53	*Data Processing*—Includes EAM and ADP equipment operators and programmers. . . .	19,937
54	*Accounting, Finance, and Disbursing*—Includes audit, accounting and disbursing. . . .	17,990
55	*Supply and Logistics*—Includes supply accounting, stock control, requisitioning, and related activities. . . .	93,384
56	*Religious, Morale, and Welfare*—Includes recreation, morale, welfare, and religious activities. . . .	5,285
57	*Information and Education*—Includes troop and public information and education. . . .	6,715
58	*Communications Center Operations*—Includes receipt and distribution of messages, the operation of communications center equipment, and setting up and administering of major field communications systems. . . .	30,630
6	ELECTRICAL AND MECHANICAL EQUIPMENT REPAIRMEN	414,648
60	*Aircraft*—Includes aircraft powerplants, electrical systems, structural components and surfaces, and related instruments and accessories. . . .	199,759
61	*Automotive*—Includes wheel and track vehicles and components and related construction equipment. . . .	51,333
62	*Wire Communications*—Includes installation and maintenance of telephones, switchboards, and central office and related interior communications equipment. . . .	28,326
63	*Missile, Mechanical and Electrical*—Includes missile propulsion and structures, and missile mechanical, electrical, hydraulic, and pneumatic systems and components. . . .	6,654

Table C-6. Enlisted strength in Department of Defense occupational groups, December 31, 1972—Continued

DOD code	Group title and description of coverage	Enlisted strength
	ELECTRICAL AND MECHANICAL EQUIPMENT REPAIRMEN—Continued	
64	*Armament and Munitions*—Includes small arms, artillery, mines, bombs, and associated mountings, and ammunition renovation.	35,020
65	*Shipboard Propulsion*—Includes marine and rail main engines, boilers, and auxiliary equipment.	49,881
66	*Power Generating Equipment*—Includes nuclear power reactors and primary electric generating plants.	32,531
67	*Precision Equipment*—Includes optical, mechanical, and electrical instruments, office machines, and non-electronic photographic, dental, and topographic equipment.	3,756
68	*Aircraft Launch Equipment*—Includes operation, maintenance, and repair of aircraft catapult and arresting gear and related equipment.	5,308
69	*Other Mechanical and Electrical Equipment*—Includes materials handling reproduction, chemical warfare and other mechanical and electrical equipment maintenance, n.e.c.	2,080
7	CRAFTSMEN	99,089
70	*Metalworking*—Includes the machining, shaping, and forming of metal and fabrication of metal parts.	16,340
71	*Construction*—Includes construction trades and pipeline construction and operation.	17,136
72	*Utilities*—Includes plumbing, heating, air conditioning, water supply and sanitation, electric wiring, power distribution, and related trades.	22,157
73	*Construction Equipment Operation*—Includes construction machines, power tools, cranes, quarry equipment, and asphalt and concrete equipment operators.	13,177
74	*Lithography*—Includes the making of printing plates, composing, and the operation of offset and letter presses.	2,866
75	*Industrial Gas and Fuel Production*—Includes the production of liquid oxygen, hydrogen, nitrogen and carbon dioxide.	1,479
76	*Fabric, Leather and Rubber*—Includes leather, rubber, and other fabric repair.	1,511
78	*Firefighting and Damage Control*—Includes firefighting, damage control, and rescue and survival activities.	11,169
79	*Other Craftsmen, N.E.C.*—Includes modelmaking, molding, camouflage, and other crafts not elsewhere classified.	13,254
8	SERVICE AND SUPPLY HANDLERS	225,360
80	*Food Service*—Includes handling, preparation, and serving of food.	64,312
81	*Motor Transport*—Includes the operation of wheel and track vehicles and railway equipment for general transport purposes, aerial and parachute delivery operations.	40,777
82	*Material Receipt, Storage and Issue*—Includes receipt, storage, issue, and shipment of both general and specialized classes of supplies, excluding ammunition.	40,094
83	*Military Police*—Includes protective and custodial services, military police, and criminal investigation.	66,121
84	*Personal Service*—Includes laundry, dry cleaning, and related services.	2,423
85	*Auxiliary Labor*—Includes unskilled labor and unskilled labor supervisors.	2,504
86	*Forward Area Equipment Support*—Includes parachute packing and repair, aerial delivery operations, and flight equipment fitting and maintenance.	9,129

SOURCE: U.S. Department of Defense, *Occupational Conversion Table, Enlisted, March 1972,* DOD 1312.1—E, and Department of Defense unpublished data.

Appendix D. State Employment Security Agencies

State employment security agencies are engaged in developing occupational projections and related manpower statistics in cooperation with the Bureau of Labor Statistics of the U.S. Department of Labor. The following list gives the addresses of the employment security agencies.

Alabama .... Department of Industrial Relations, Montgomery 36104
Alaska .... Employment Security Division, Department of Labor, Juneau 99801
Arizona .... Department of Economic Security, Phoenix 85005
Arkansas .... Employment Security Division, Department of Labor, Little Rock 72203
California .... Employment Data and Research Section, Department of Labor, Human Resources Development, Sacramento 95808

Colorado .... Department of Labor and Employment, Denver 80203
Connecticut .... Employment Security Division, Connecticut Labor Department, Hartford 06115
Delaware .... Department of Labor, Wilmington 19899
District of Columbia .... Manpower Training and Employment Services Administration for the District of Columbia, Washington 20212
Florida .... Department of Commerce, Tallahassee 32304

Georgia .... Employment Security Agency, Department of Labor, Atlanta 30312
Hawaii .... Department of Labor and Industrial Relations, Honolulu 96811
Idaho .... Department of Employment, Boise 83707
Illinois .... Division of Research and Statistics, Department of Labor, Chicago 60606
Indiana .... Employment Security Division, Indianapolis 46204

Iowa .... Employment Security Commission, Des Moines 50319
Kansas .... Employment Security Division, Department of Labor, Topeka 66603
Kentucky .... Bureau of Employment Security, Department of Economic Security, Frankfort 40601
Louisiana .... Department of Employment Security, Baton Rouge 70804
Maine .... Employment Security Commission, Augusta 04330

Maryland .... Department of Employment and Social Services, Baltimore 21201
Massachusetts .... Division of Employment Security, Boston 02114
Michigan .... Employment Security Commission, Detroit 48202
Minnesota .... Department of Manpower Services, St. Paul 55101
Mississippi .... Employment Security Commission, Jackson 39205

Missouri .... Division of Employment Security, Jefferson City 65102
Montana .... Employment Security Commission, Helena 59601
Nebraska .... Division of Employment, Department of Labor, Lincoln 68509
Nevada .... Employment Security Department, Carson City 89701
New Hampshire .... Department of Employment Security, Concord 03301

New Jersey .... Division of Planning and Research, Department of Labor and Industry, Trenton 08625
New Mexico .... Employment Security Commission, Albuquerque 87103

New York	Research and Statistics Office, Division of Employment, New York State Department of Labor, Albany 12201
North Carolina	Division of Statistics, Department of Labor, Raleigh 27602
North Dakota	Employment Security Bureau, Bismark 58501
Ohio	Division of Research and Statistics, Bureau of Employment Services, Columbus 43216
Oklahoma	Employment Security Commission, Oklahoma City 73105
Oregon	Employment Division, Department of Human Resources, Salem 97310
Pennsylvania	Bureau of Employment Security, Department of Labor and Industry, Harrisburg 17121
Rhode Island	Division of Statistics and Census, Department of Labor, Providence 02908
South Carolina	Employment Security Commission, Columbia 29202
South Dakota	Employment Security Department, Aberdeen 57401
Tennessee	Department of Employment Security, Nashville 37219
Texas	Employment Commission, Austin 78778
Utah	Department of Employment Security, Salt Lake City 84111
Vermont	Department of Employment Security, Montpelier 05602
Virginia	Division of Research and Statistics, Department of Labor and Industry, Richmond 23214
Washington	Employment Security Department, Olympia 98504
West Virginia	Department of Employment Security, Charleston 25305
Wisconsin	Department of Industry, Labor and Human Relations, Madison 53701
Wyoming	Employment Security Commission, Casper 82601